

MOOG



PRELIMINARY INSTALLATION & USER'S MANUAL

SECTION 3: WIRING AND INSTALLATION

ERRATA E:

E.1 Introduction

This Errata sheet details changes to the preliminary release of the DS2100 Manual. The corrected information for the manual is detailed below.

E.2 Changes

Page	Description	Change
1-5	Update to DS2100 Boxcar	Reference to Form 757 added to Boxcar for valid ordering numbers.
3-54, 3-74	Error in Encoder connector wiring diagram	Clock + & Data + Lines swapped in wiring information Clock - & Data - Lines swapped in wiring information
2-7	Line fuses specified in manual for Size C drives incorrect.	Changed line fuse requirements for Size C drives from 160 FEE 690V to 100 FE 690V Bussmann Fuses.
3-64	Figure 3.46 Incorrect. Lines labelled incorrectly	Receive and Transmit lines re-labelled to show Receive on DS2100 side is connected to Transmit in PC side & Transmit on DS2100 side is connected to Receive on PC Side.
3-54, 3-74	Error in Encoder connector wiring diagram	For Heidenheim endat encoder, necessary to swap channel A and channel B signals. Required as Heidenheim define positive direction phasing between A & B channels in reverse to Stegmann.

3.11.5 Motor Encoder Connection

The DS2100 encoder input supports a variety of encoders. These include Analogue, SSI, Hiperface and Endat. The connections to the drive for each of these encoder types are given in Table 3.25.

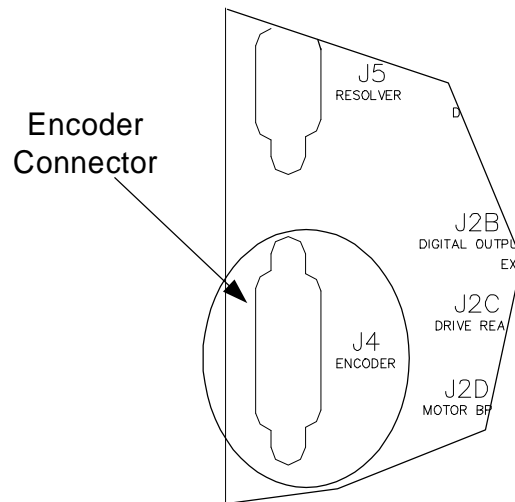


Figure 3.38 Motor Encoder Connector Location

- Fixed connector: 15 pin, female Sub-D connector
- Mating connector, 15pin male Sub-D
- Wiring: cable. 28-18AWG (0.14-0.82mm²)

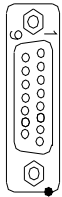
Pos	Encoder Type			
	Analogue	SSI	Hiperface	Endat
J4.1	Shield	Shield	Shield	Shield
J4.2	- Sine	-	- Sine	- Channel B
J4.3	- Cosine	-	- Cosine	- Channel A
J4.4	Gnd Supply	Gnd Supply	Gnd Supply	Gnd Supply
J4.5	-	- Clock	-	- Clock
J4.6	- Channel Z (Zero)	- Data	RS485 -	- Data
J4.7	-	-	-	-
J4.8	NTC/PTC	NTC/PTC	NTC/PTC	NTC/PTC
J4.9	+ Sine	-	+ Sine	+ Channel B
J4.10	+ Cosine	-	+ Cosine	+ Channel A
J4.11	+5 V .. +12V Supply (150 mA max.)	+5 V .. +12V Supply (150 mA max.)	+5 V .. +12V Supply (150 mA max.)	+5 V .. +12V Supply (150 mA max.)
J4.12	- Fault	+ Clock	-	+ Clock
J4.13	+ Channel Z (Zero)	+ Data	RS485 +	+ Data
J4.14	Gnd Supply	Gnd Supply	Gnd Supply	Gnd Supply
J4.15	NTC/PTC	NTC/PTC	NTC/PTC	NTC/PTC

Table 3.25 Encoder Cable Input Connections

3.14.5.7 Encoder

- Fixed connector: 15 pin, female Sub-D connector
- Mating connector, 15pin male Sub-D
- Wiring: cable. 28-18AWG (0.14-0.82mm²)

15-Pin Sub-D Connector
Plug (male) on cable



DS2100 Cable End
J4

Pos	Encoder Type			
	Analogue	SSI	Hiperface	Endat
J4.1	Shield	Shield	Shield	Shield
J4.2	- Sine	-	- Sine	- Channel B
J4.3	- Cosine	-	- Cosine	- Channel A
J4.4	Gnd Supply	Gnd Supply	Gnd Supply	Gnd Supply
J4.5	-	- Clock	-	- Clock
J4.6	- Channel Z (Zero)	- Data	RS485 -	- Data
J4.7	-	-	-	-
J4.8	NTC/PTC	NTC/PTC	NTC/PTC	NTC/PTC
J4.9	+ Sine	-	+ Sine	+ Channel B
J4.10	+ Cosine	-	+ Cosine	+ Channel A
J4.11	+5 V .. +12V Supply (150 mA max.)	+5 V .. +12V Supply (150 mA max.)	+5 V .. +12V Supply (150 mA max.)	+5 V .. +12V Supply (150 mA max.)
J4.12	- Fault	+ Clock	-	+ Clock
J4.13	+ Channel Z (Zero)	+ Data	RS485 +	+ Data
J4.14	Gnd Supply	Gnd Supply	Gnd Supply	Gnd Supply
J4.15	NTC/PTC	NTC/PTC	NTC/PTC	NTC/PTC

3.13.1 RS232 Serial Communications Interface

The pin assignment enables use of a 9-pin Sub-D cable with all signals connected straight through.

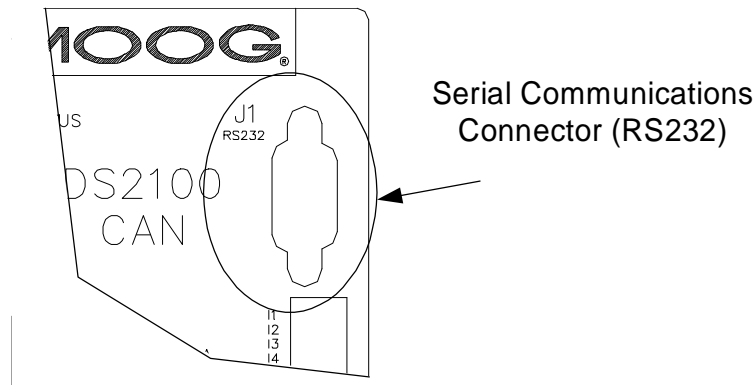


Figure 3.45 RS232 Connector Location

- Fixed connector: 9 pin, female Sub-D connector
- Mating connector, 9 pin male Sub-D
- Wiring: cable. 28-18AWG (0.14-0.82mm²)

Pos.	DS2100 Signal	Function	PC Signal
J1.1	-	connected to pin 4	DCD input
J1.2	TxD	Transmit Data	RxD input
J1.3	RxD	Receive Data	TxD output
J1.4	-	connected to pin 1 and 6	DTR output
J1.5	Gnd	Gnd	Gnd
J1.6	-	connected to pin 4	DSR input
J1.7	-	connected to pin 8	RTS output
J1.8	-	connected to pin 7	CTS input
J1.9	-	unused	RI input

Table 3.29 J1, DS2100 RS232 Serial Interface Connector

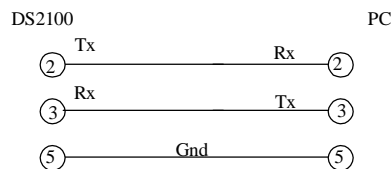


Figure 3.46 DS2100's J1 RS232 Wire Pin-out

The RS232 Cable shield should be connected to the metal body of the D-Type connector.

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This section covers the installation, wiring and cabling of the Moog DS2100 Servo-drive series. A pictorial diagram of a single-axis system, with typical components included, is shown in Figure 3.1. Users are directed to read Section 2, Safety Instructions, before proceeding with wiring and installation.



WARNING - This equipment must be permanently and reliably connected to Earth and all conductive parts in the IP54 rated enclosure in which the DS2100 Series Servo-drive is installed must be reliably connected to Protective Earth. A Protective Earth connection must come directly from an approved AC mains network. Stranded copper-wire is recommended to carry the earth.

FAILURE TO PROVIDE AN ADEQUATE EARTH MAY CAUSE SERIOUS PERSONAL INJURY AND EQUIPMENT MALFUNCTION.

3.1 System Components

The following components are required to build a Moog brushless motor digital control system (refer to Figure 3.1). The user supplies all components besides the DS2100, EMC-Brackets, motor and other accessory cabling.

3.1.1 A.C. Mains Power Interface

The DS2100 should be connected to a three-phase AC supply. Operation with a single-phase supply is only allowed with the G361-x003 and G361-x006 variants of the drive. For single-phase operation, the phase supply voltage must be limited to 230V and the input power to the drive limited to 1.1kW.

3.1.2 A.C. Input Line Protection

Details of the recommended Line fuses are given in Section 2 of this manual. Alternatively an AC mains Circuit Breaker (Instantaneous Trip Type) can be used as a protective device provide its ratings are equivalent to the recommended fuses.

After a power loss to the servo-drive, the motor will continue running until its stored energy is dissipated through friction alone, or will be stopped by a motor-equipped brake if a brake is available.

It is also recommended to install a contactor rated for the DS2100 input between the line fuses and the EMC filter at the input of the DS2100 (refer to Figure 3.1). This contactor should be controlled directly by user supplied Emergency Stop Buttons and other series connected safety switches to remove AC input power in any situation affecting personnel safety.



WARNING - The supply-disconnecting device (circuit breaker) must be switched to the OFF position before any service or maintenance activity is commenced.

3.1.3 Line Filter Requirements

Details of the recommended line filters for each of the DS2100 variants are given in Section 2 of this manual.

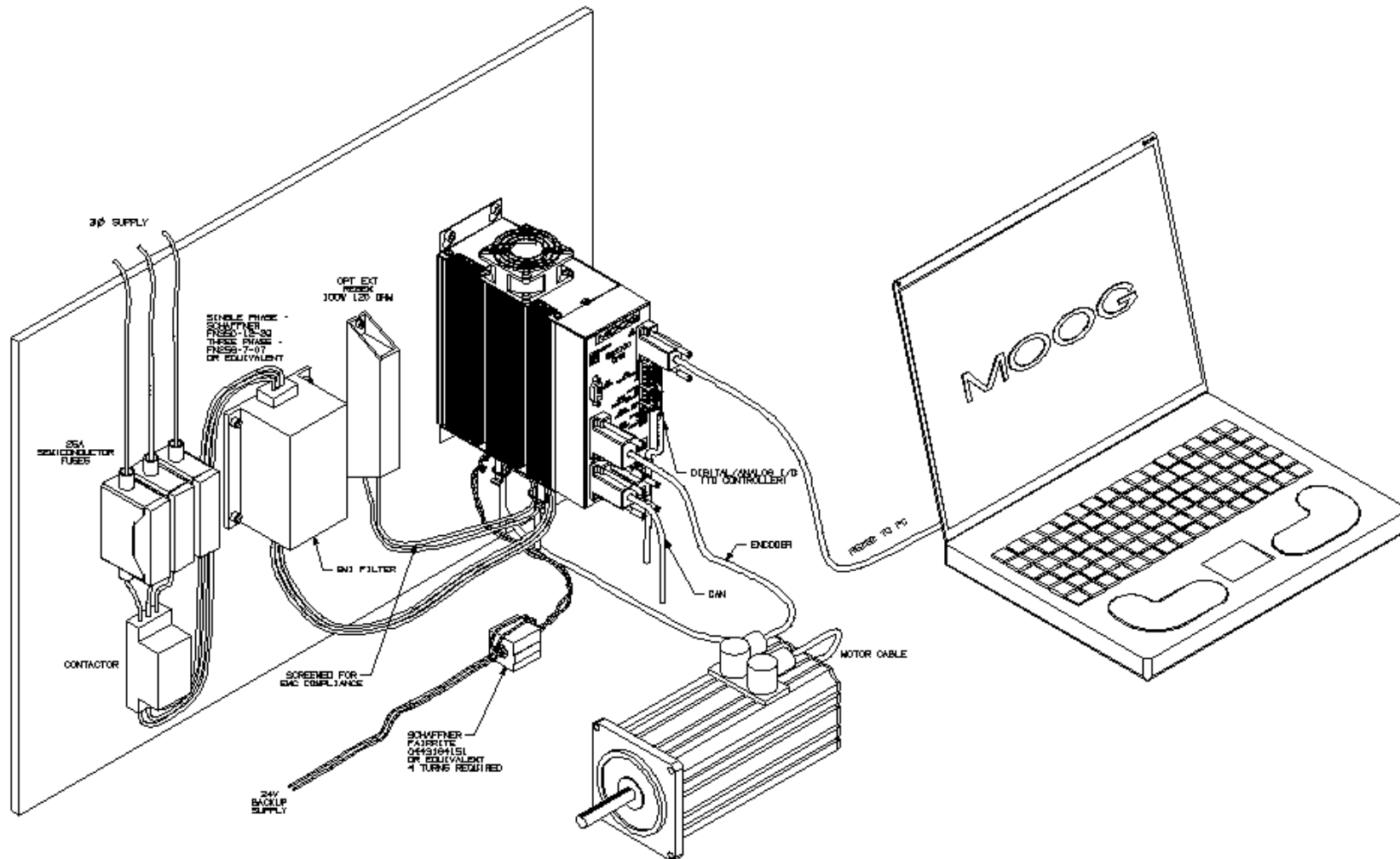


Figure 3.1 Typical DS2100 System Components (μA Size)

3.1.4 Serial Set-up Terminal (User-Supplied)

An RS-232 interface should be established for individual servo-drive communications, using a PC. The PC can run Moog's WinDrive Windows-based user-interface program.



The personal computer using Windrive is a service engineering tool only and must be installed so that use of the key sequences which allow control of the machine functions is accessible to authorised qualified service personnel only. All such service set-up computers must be CE - marked as compliant with the EU EMC Directive.

3.1.5 Control-Backup Power Input (User Supplied)

The DS2100 requires a control power source to supply backup-power for the control electronics. This control-backup power is useful where the user requires that the DS2100 does not lose absolute position data or status information when AC mains power is removed from the DS2100.

The user is directed to the local Moog sales office or authorised distributor for a recommended list of these control power source devices.



The G361-x003 &-x006 **MUST** have a 24V_{dc} logic backup supply connected for the drive to operate. No internal high voltage backup is provided on these smaller models.

The 24V_{dc} control power option allows high voltage motor power to be removed from a DS2100 Series Servo-drive without losing control power.

The acceptable voltage range for this supply is 24V_{dc} ±10% with a minimum current rating of 2A_{dc} per DS2100 Series Servo-drive connected. A low cost unregulated DC supply is adequate.



NOTE - The 24V_{dc} power supply must be compliant with the requirements of the EU EMC Directive. The 24V_{dc} output from the power supply must be Safety Extra Low Voltage (SELV - as defined by European standard EN 60950).

3.1.6 Brushless Servo motors

The DS2100 series Servo-drive is compatible with Moog brushless servomotors.

Normal connection to the motor requires two cables - a power and a signal cable. The power cable provides three-phase stator power, protective earth and brake connections. The signal cable carries position transducer feedback signals and motor temperature detection connections.

3.1.6.1 Brushless Motor Brake 24V Power Supply

The motor brake requires a 24V_{dc} supply for release. This should be rated to cover at least twice the sums of the rated currents of all brakes connected.

3.1.7 Heatsinks and Climatic Control

The need for air conditioning will depend on the duty cycle of the system and the surrounding ambient temperature. The maximum allowable ambient temperature is 40°C (104°F). The humidity range is 5-95% non-condensing.

All DS2100 Servo-drives incorporate internal cooling fans and integral heat sinks. Other than controlling ambient conditions, additional heat sinking is not required.

3.2 Equipment Mounting

This section details the mechanical dimensions of the DS2100 chassis, as well as required clearances for cabling etc. The DS2100 is designed to be panel or cabinet mounted. The DS2100 must be mounted in a vertical orientation. The DS2100 must be panel mounted within an enclosure or cabinet that provides a degree of ingress protection against liquids and objects of at least IP54. Such enclosures or cabinets must be accessible to technically qualified service or maintenance persons only. It is recommended that the cabinet be ventilated using filtered or conditioned air, free of corrosive or electrically conductive contaminants. The accumulation of dust, dirt, etc. on the equipment must be avoided. A minimum clearance above and below each of the DS2100 drive sizes is required. These distances are detailed in Table 3.1.

DS2100 Size	Minimum Clearance Top (mm)	Minimum Clearance Bottom (mm)
μ A & A	60	100
B	60	100
C	80	160
D	100	200

Table 3.1 Minimum Clearance around DS2100 Drives

If any of the DS2100 units are mounted in a closed cabinet, allow 80mm clearance at the front for cable bends.

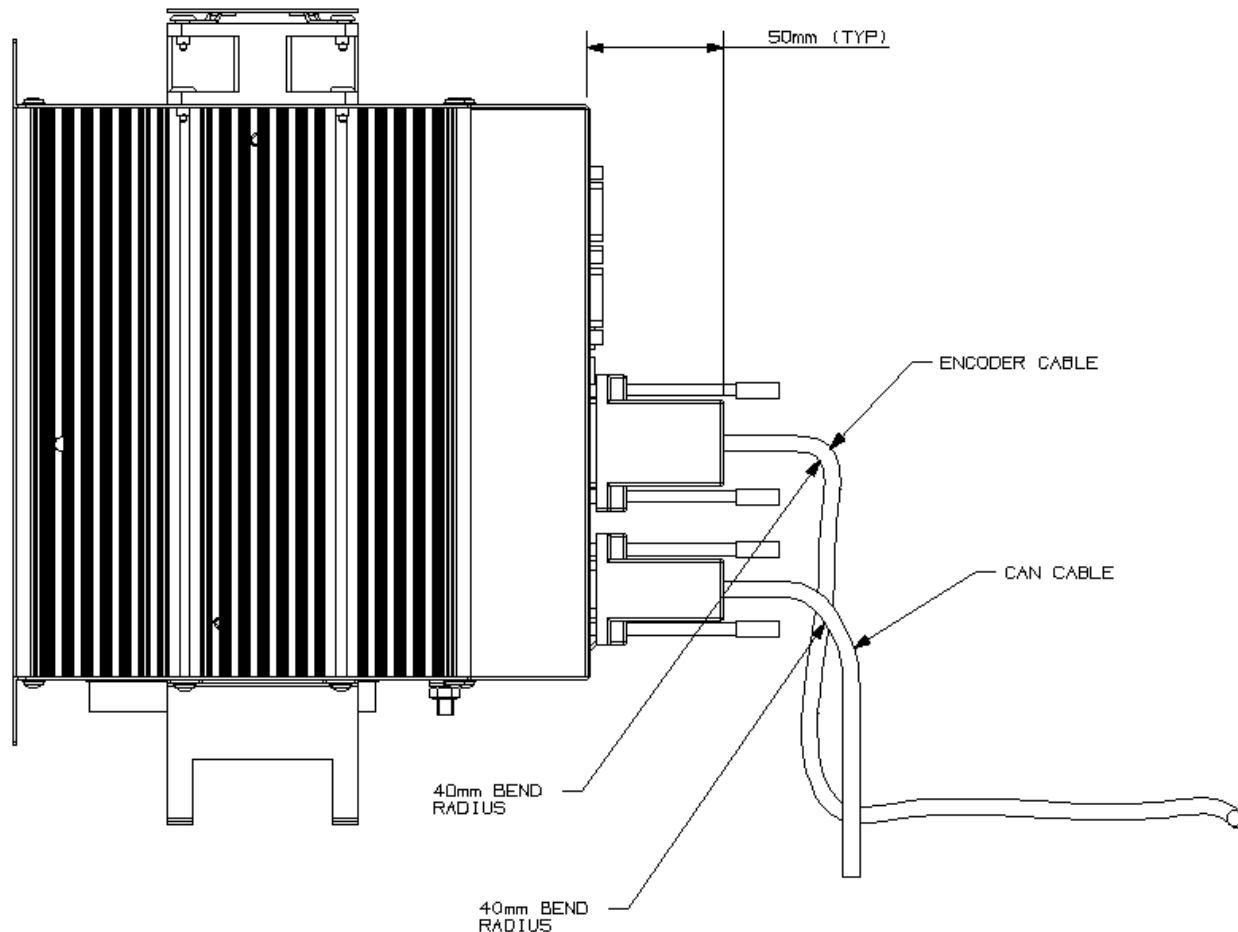


Figure 3.2 Typical DS2100 Cable Bend Radius Requirements

The DS2100 must be permanently and reliably connected to Earth and all conductive parts in the IP54 rated enclosure or cabinet must be permanently connected to Earth. The impedance between the earth terminal and any accessible part of the enclosure or cabinet should be less than or equal to 0.1 Ω .



NOTE - The DS2100 Series Servo-drives are system components that must be installed in the correct manner to ensure that all electromagnetic compatibility (EMC) requirements are met. (Refer to Section 2 of this User's Guide).

The DS2100 must be mounted on a panel with a flat solid surface in a manner that ensures that EMC earthing requirements are met.

There must be a clean flat conductive surface at all of the mounting points. Remove paint or other insulating materials and provide conductive corrosion protection at the mounting points. It is important that there is good high-frequency bonding between the panel and the DS2100 Servo-drive. Conductive hex socket head bolts with conductive locking washers should be used.

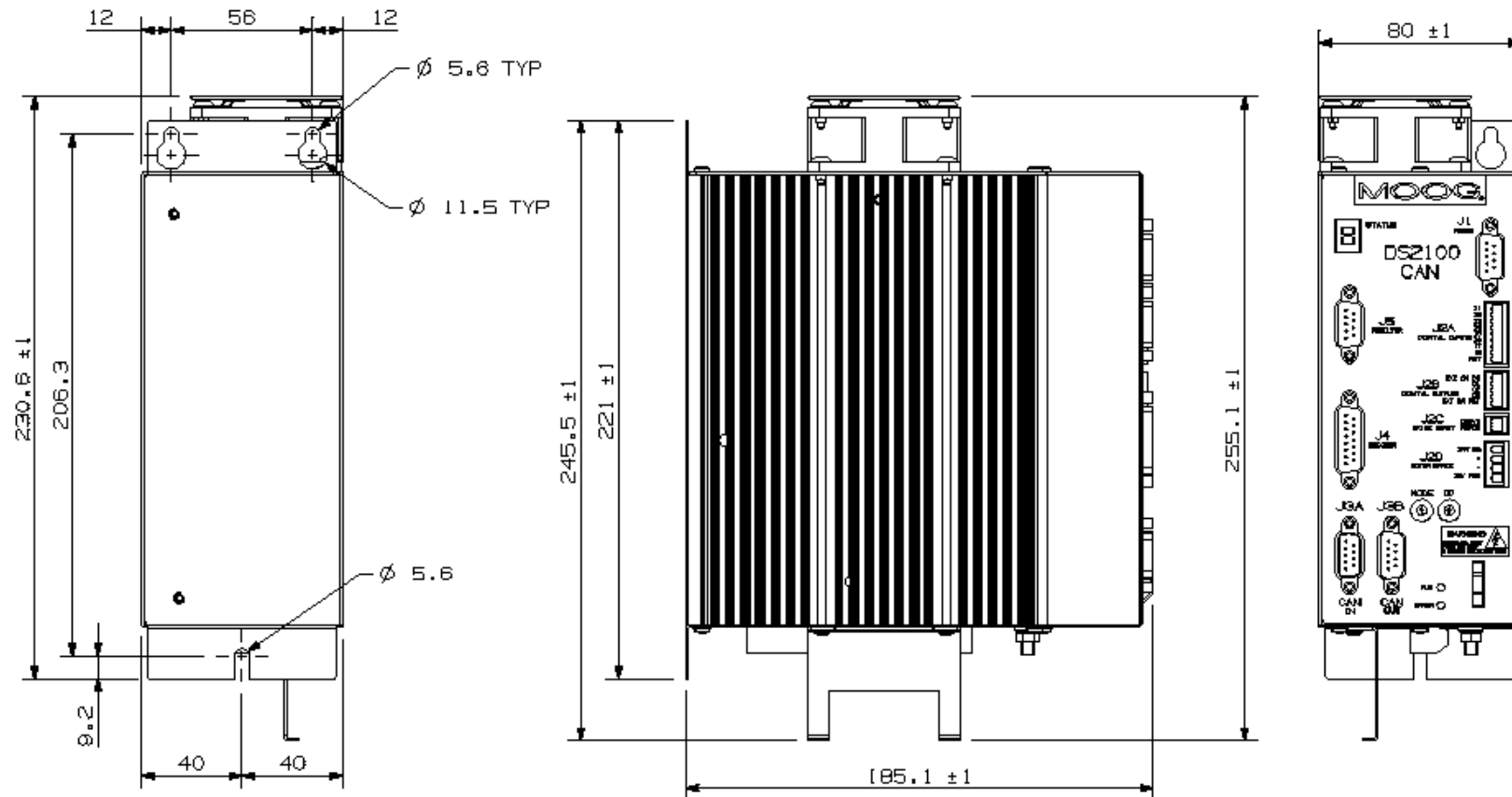


Figure 3.3 DS2100 μ A Mechanical & Mounting Dimensions

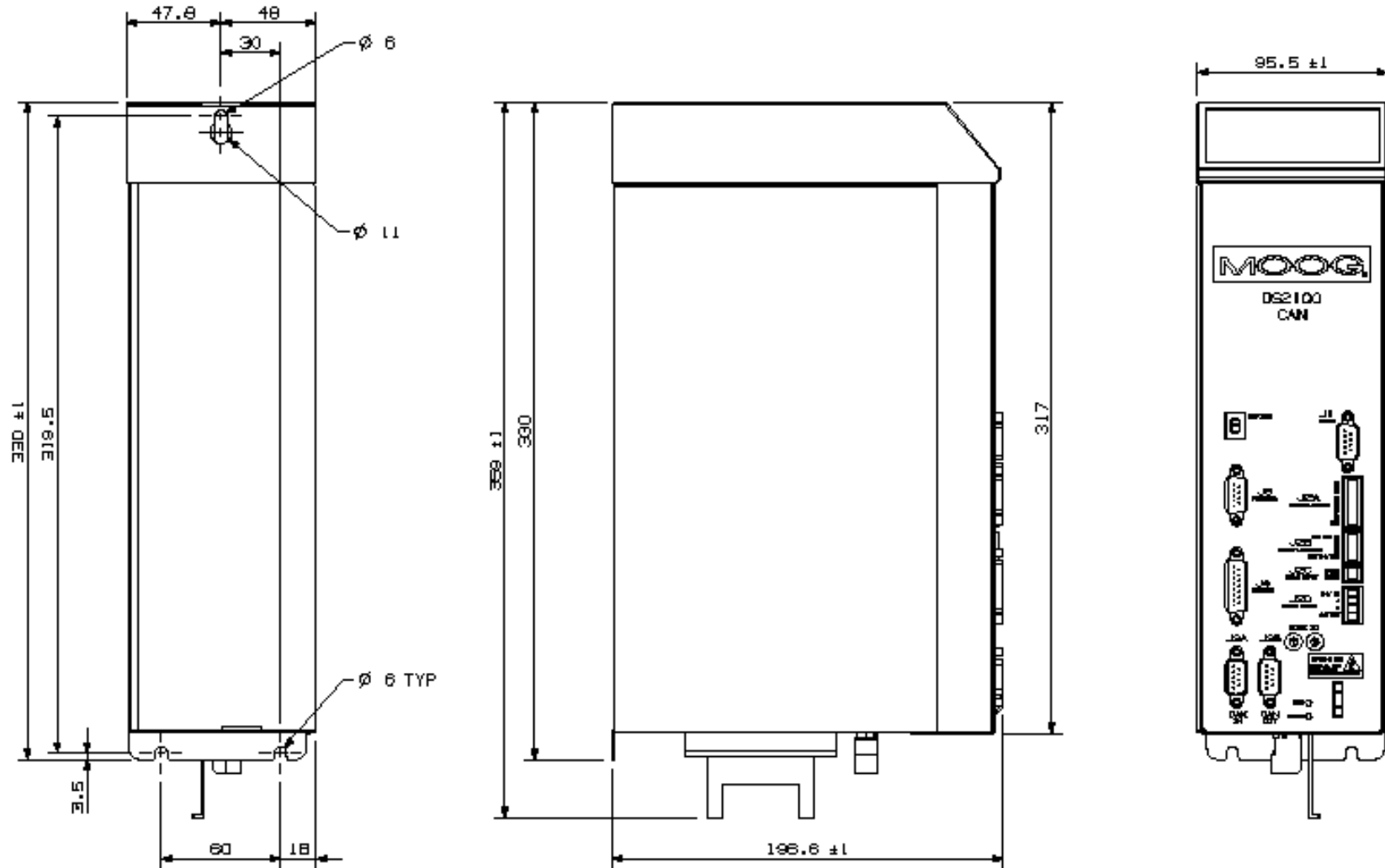
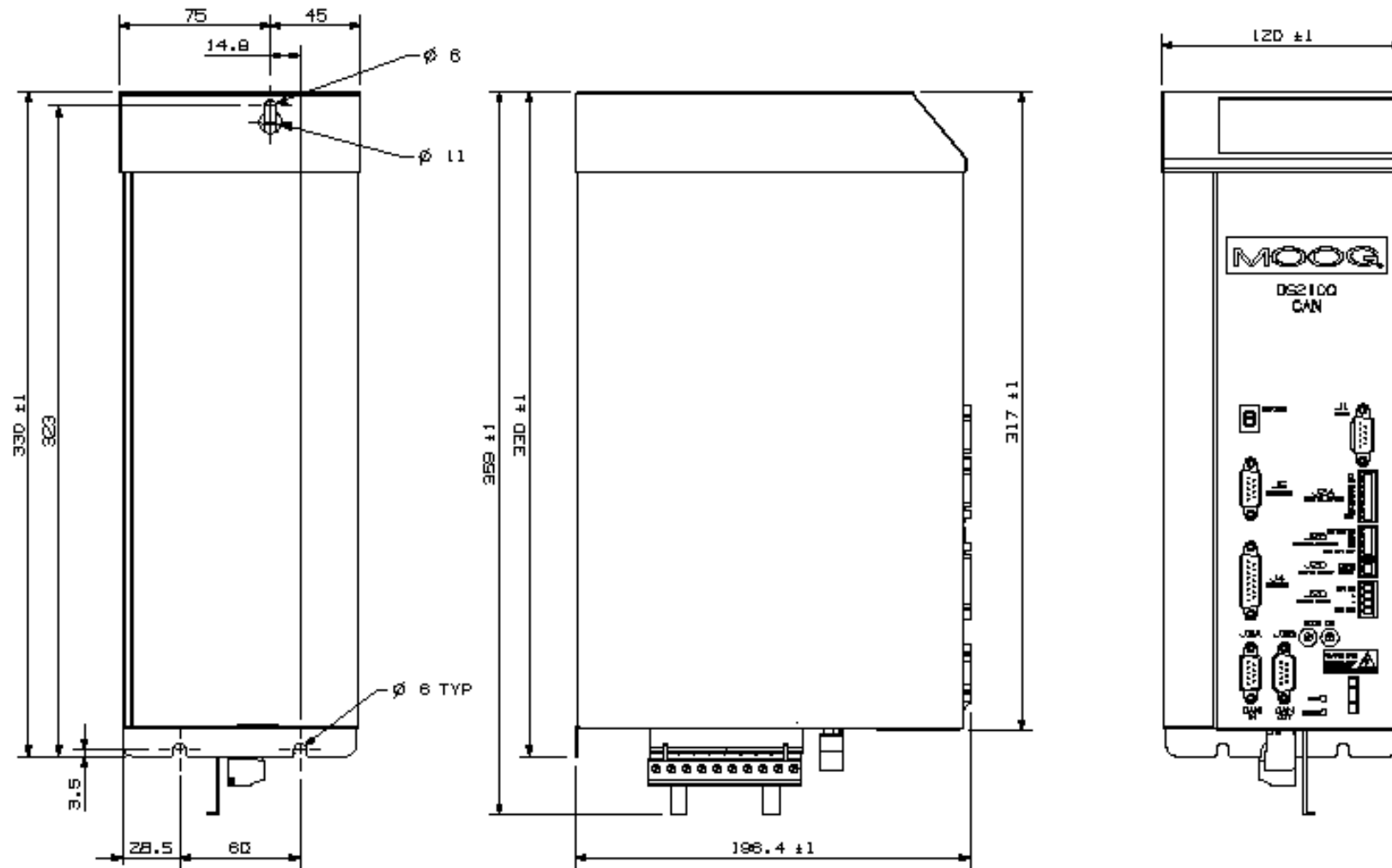
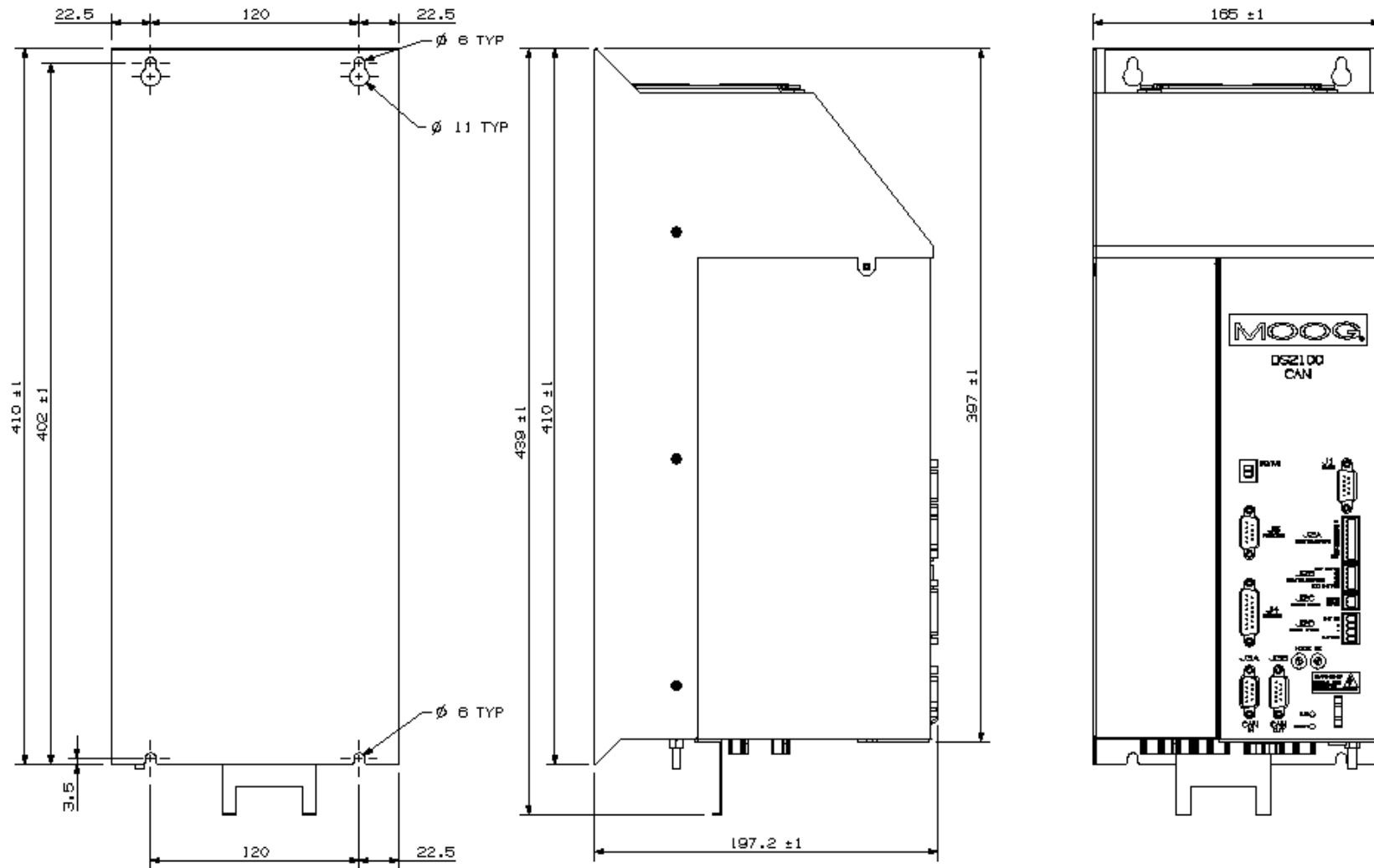


Figure 3.4 DS2100 A Mechanical & Mounting Dimensions





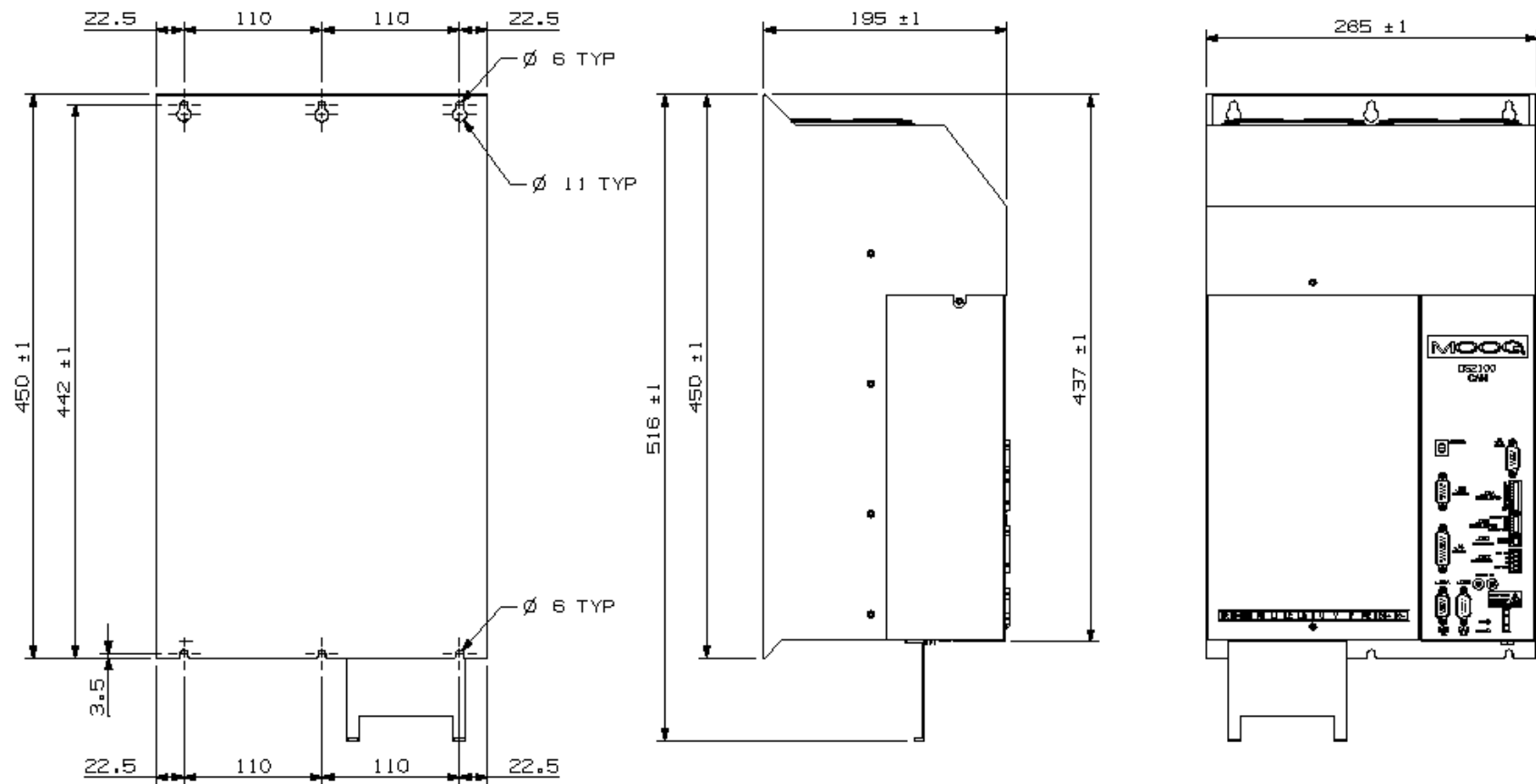


Figure 3.7 DS2100 D Mechanical & Mounting Dimensions

3.2.1 CE Items for Mechanical Installation

Additional electromagnetic compatibility (EMC) measures must be installed on equipment associated with the DS2100 Servo-drive. The following measures must be implemented:

- All external Regen (Regenerative circuit) resistors used with the DS2100 must be installed in enclosures which provide a degree of ingress protection against liquids and objects of at least IP22 and which are accessible to technically qualified service or maintenance persons only. Protection against electric shock must be maintained when installing these resistors.
- Use shielded cable to connect the external regen resistor (if installed) to the DS2100 power supply. The length of this cable should be as short as possible. The shields of these cables should be earthed to Chassis Earth using the optional EMC Bracket kit or the panel earth bar. Alternatively, if the cable is required to pass through an enclosure panel earthed to Chassis Earth, the shield may be earthed to the panel by use of a 360 degree metal cable gland.
- Cables supplying external d.c. supply voltages to the DS2100 Series Servo-drives (for example, the 24 Vd.c. supply) must be as short as possible. The supply wires should be twisted together or alternatively shielded cable should be used.
- Cables connecting the D.C. Bus from the DS2100 Power Supply to other DS2100 Servo-drives must be as short as possible. The supply cables should be shielded.
- Motor power cables must be shielded with the cable shield securely connected to Chassis Earth at both ends of the cable. At the DS2100 Servo-drive end of the cable, the shield should be earthed using the EMC Bracket.
- Motor feedback & signal cables must be shielded with the cable shield securely connected to Chassis Earth at both ends of the cable.
- Signal cables must be shielded with the cable shield securely connected to make a good HF earth bond to Chassis Earth at both ends of the cable.

Further details for the correct installation and shielding of cables and conductors are given in Section 2.



CAUTION - Enclosure or cabinet temperature control is critical for performance, reliability and life of electrical components. Maintaining a uniform temperature (check for hot spots) within the specified values for the equipment will prevent premature failure due to temperature stress.

3.3 Power Dissipation

To calculate cabinet cooling requirements, Table 3.2 provides approximate equipment power dissipation values. If the application employs regeneration, be sure to add the regen resistor power dissipation to the numbers quoted in Table 3.2 below, (use the continuous wattage rating of the regen resistor if the actual application regen dissipation is unknown).

DS2100	Power Dissipation (Watts)							
	-003	-006	-008	-014	-025	-030	-050	-060
	53	100	110	180	300	400	650	800

Table 3.2 Estimated Power Dissipation for the DS2100 Servo-drives

3.4 DS2100 Connector Terminals

Figure 3.8 to Figure 3.12 below detail the connectors on the DS2100 (all sizes).

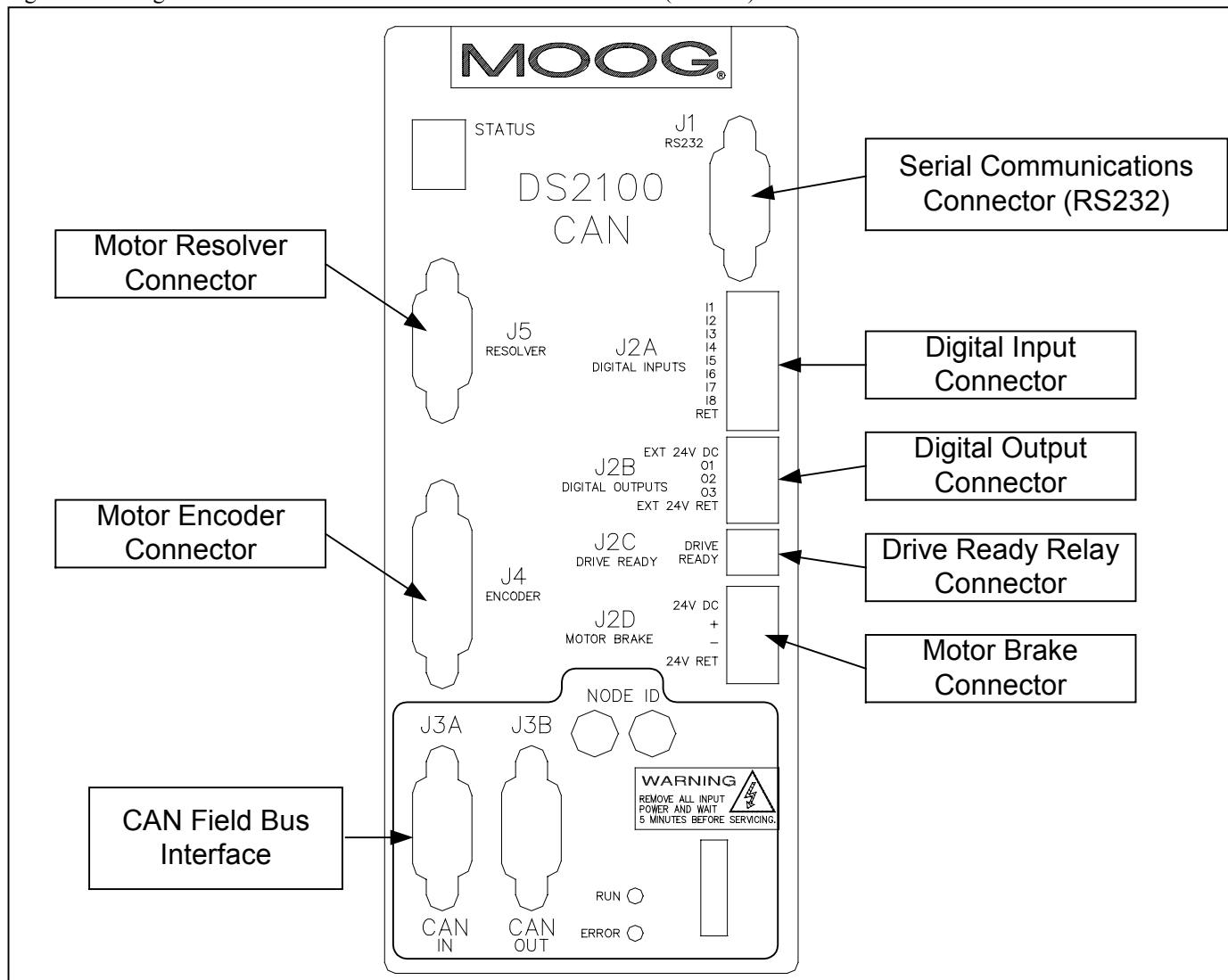


Figure 3.8 DS2100 Control Card Connector Terminals

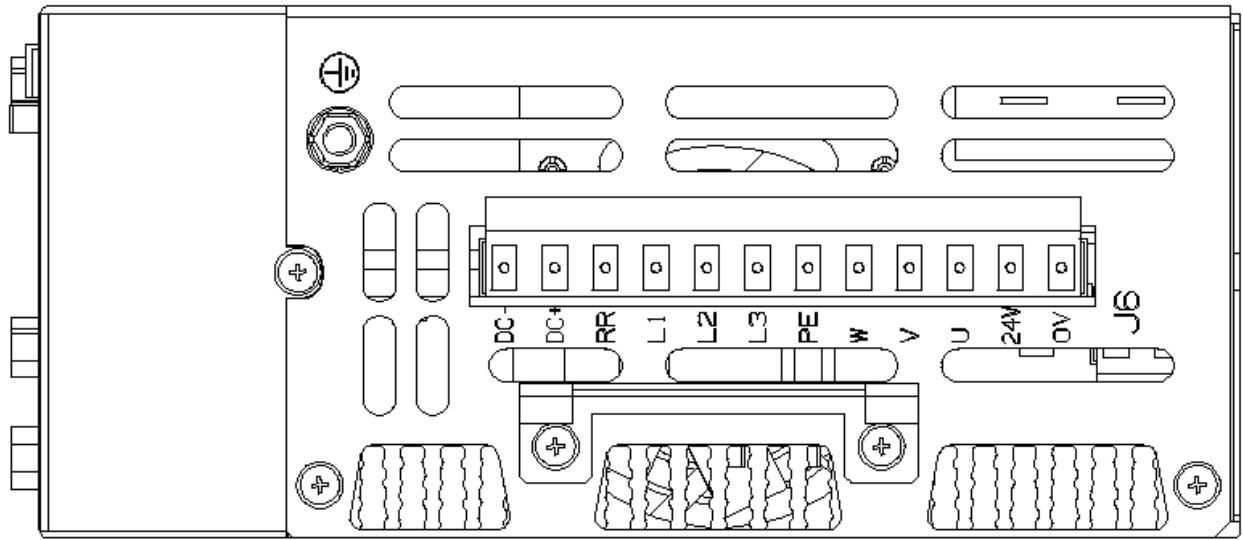


Figure 3.9 DS2100 Size μ A Power Connector Terminals

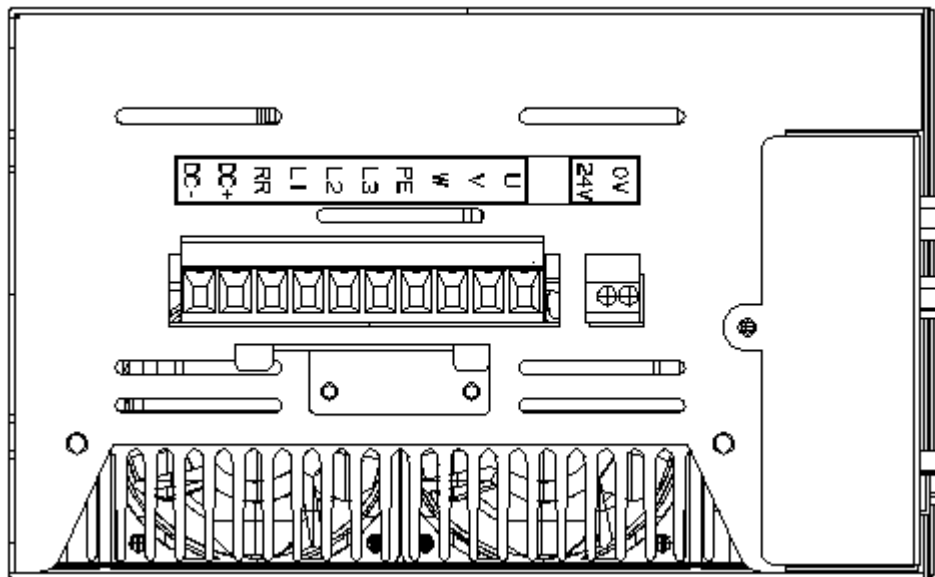


Figure 3.10 DS2100 Size A & B Power Connector Terminals

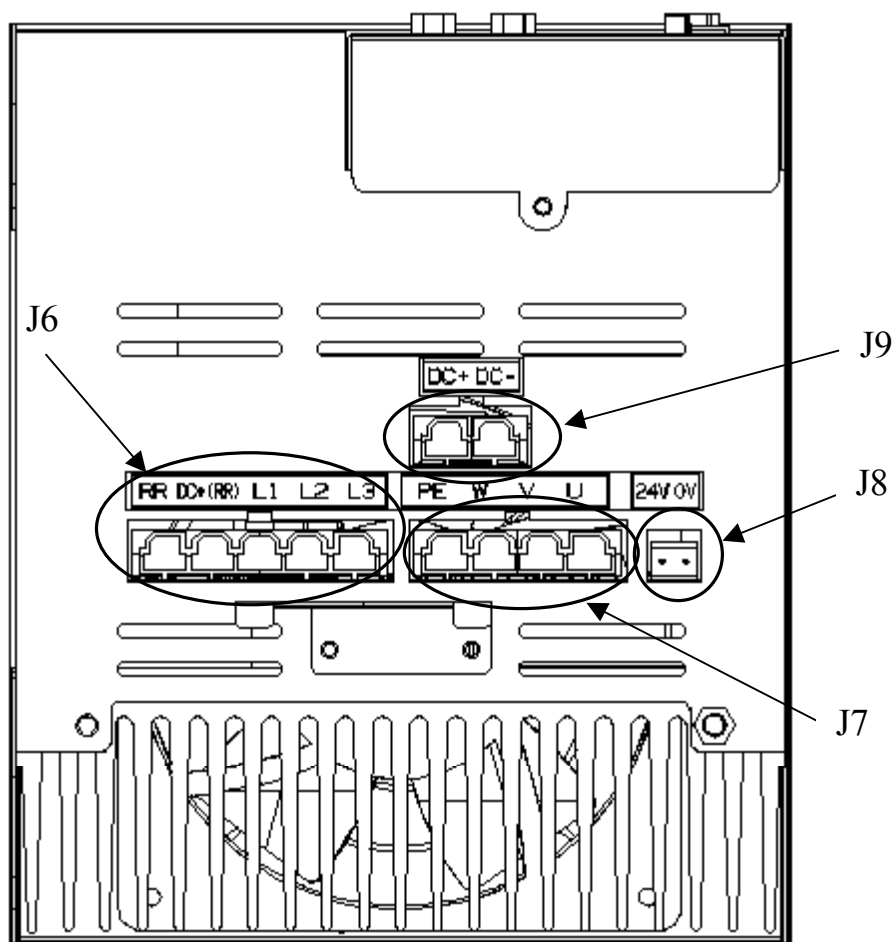


Figure 3.11 DS2100 Size C Power Connector Terminals

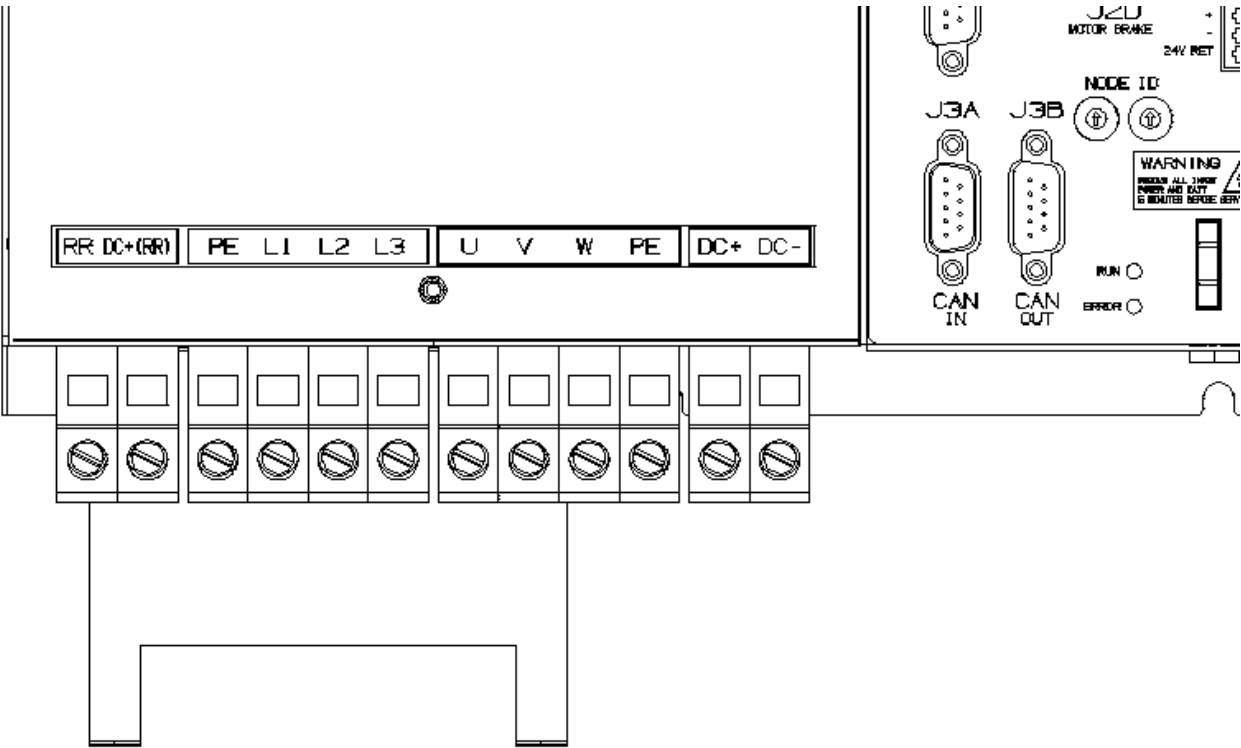


Figure 3.12 DS2100 Size D Power Connector Terminals

3.5 General System Wiring Guidelines

The following is a general reminder of the cable requirements for the DS2100 Series Servo-drives and related equipment.

i

NOTE - Cabling and component wiring is critical in obtaining successful operation of the system. Pay close attention to specified wiring practice, cabling information, earthing and shielding requirements. Improper wiring can result in electrical noise generation and unstable motor performance.

Size wire in accordance with standard wiring practice and local codes for amperage and wire length requirements. Recommended wire sizes are given in Section 2.

Avoid close parallel routing of signal wires and power wires, both inside and outside of the control cabinet. High voltage bus wires should be shielded and their length should be minimised.

Ensure proper chassis earths on all equipment. Terminate all individual chassis earths from power supply and servo-drives to a single tie point, (i.e. cabinet earth bus). Keep the distance from earth bus to earth ground as short as possible. Similarly, keep distance from servo-drive and power supply chassis earths to the tie point as short as possible. Chassis earth should be run close to D.C. Bus wires to minimise EMI. The impedance between the earth terminal and any accessible part of the equipment enclosure or cabinet should be less than or equal to 0.1Ω

Tighten all terminal screws securely to avoid faulty operation. Torque screws to the specified values

All power connections to the DS2100 μA , A, B & C Series Servo-drives are through removable plug-in mating connectors. Do not solder the ends of the cables to be inserted into screw clamp terminals. All power connections to the DS2100 D are via screw terminal connections.



WARNING – The removable plug-in mating connectors are for ease of wiring and are not suitable for connection or dis-connection when power is applied. All dis-connections must be made with power removed.



WARNING - All electrical supply wires and cables to this equipment must be installed in conduits (cable routings) which are smooth and free from sharp edges.



CAUTION - Shielded cable is required to be installed by the user for many external user cable connections to the DS2100 Servo-drive. Details of areas where shielded cable must be installed and details of earthing arrangements which must be implemented for the shields of such cables are given in the relevant sections.



CAUTION - All external electrical wiring connected to this equipment must be color coded in accordance with European Standard EN 60204-1 requirements..



CAUTION - Additional electromagnetic compatibility (EMC) measures which must be installed on equipment cables associated with the DS2100 Servo-drive are given in Section 2 of this User's Guide.



CAUTION - All wires and cables entering and leaving the IP54 rated enclosures or cabinets containing the DS2100 Servo-drive and the Regen resistor(s) must be protected and anchored in accordance with the requirements of EN 60204-1.

3.5.1 Drive Contactor (User Supplied)

A contactor (suitably rated for the particular DS2100 should be installed just before the AC input line filter of the DS2100. The contactor acts as a remote switch that may cut off the AC mains supply in the event of an emergency shutdown. This contactor should be sized based on the continuous power of the system.

3.5.2 Wiring notes for J6, J7, J9 connectors (Size C)

The connectors used on the DS2100 Size C are formed using crimp terminals. The appropriate crimps (Molex type 42815-0031) are supplied together with the floating connectors for J6, J7, and J9. These crimps are sized for a 8 AWG (8.4 mm²) cable with a 10 mm wire stripping. It is recommended to use the appropriate Molex crimping tool (63814-0000, or 63811-1500, or equivalent). After crimping, the contact must be inserted into the floating connector with the correct orientation and should be held in position by the TPA (Terminal Position Assurance) jumper, as shown in Figure 3.13.

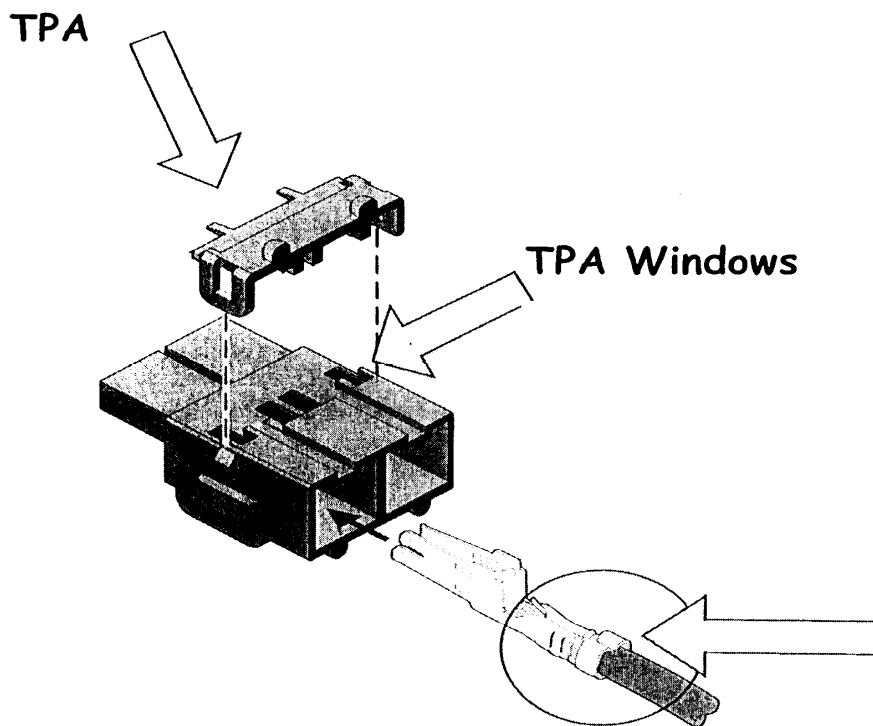


Figure 3.13 DS2100 Size C Crimp Assembly

3.6 Sequence of Component Wiring Recommendations

The following sequence for wiring is a recommendation. Individual wiring steps are denoted by a box character, which can be used as an installation check off list.

The terminal block layout on all power supplies and servo-drives has been designed to isolate low voltage from high voltage circuits. Cabinet conduits should be arranged to maintain this physical separation.

a) Power Circuit Wiring

- ☐ Wire a 24V Logic Supply to the drive (Required on μ A size drives). Fit a suitable EMC filter on the 24V logic Supply and fuse.
- ☐ Wire a.c. mains input to a user supplied fuses. Make a secure and reliable connection between the chassis of the equipment and Earth.
- ☐ Fit a suitable EMC Mains Line Filter after the User supplied fuses and contactor.
- ☐ Wire a.c. mains from the user-supplied contactor to the power input poles of the DS2100.

b) Servo-drive Wiring

- ☐ Plug in Axis I/O cable to J2 and connect other end to user I/O equipment.
- ☐ Plug in resolver cable at J5 (or Encoder Cable to J4).
- ☐ Connect appropriate communications cabling (RS232 at J1, and/or Field Bus

c) Motor Wiring

- ☐ Repeat the steps listed in this Section for each motor in the system.
- ☐ Plug in and screw tight resolver/encoder cable to motor position connector.
- ☐ Plug in and screw tight motor power cable to motor power connector. Also connect the brake terminations at J2D (if provided).
- ☐ Connect motor power cable to appropriate drive power terminals.

3.7 Three-Phase A.C. Mains Power Source Configuration

The DS2100 may be supplied from a three-phase a.c. mains input. In this case the following user supplied options are required:-

1. Three-Phase Mains Fusing
2. Mains Line Filter
3. 24Vd.c. Power Source & Fuse
4. 24V d.c. EMC Filter

Note that for DS2100 sizes A,B,C & D, if the a.c. mains is still applied, and the control-backup power is removed, then the DS2100 control section will still operate correctly. Control power can still be generated from the high voltage D.C. Bus.

Figure 3.14 below outlines typical interconnect in a multi-axis DS2100 system, which is powered by 3-phase a.c. mains supply.

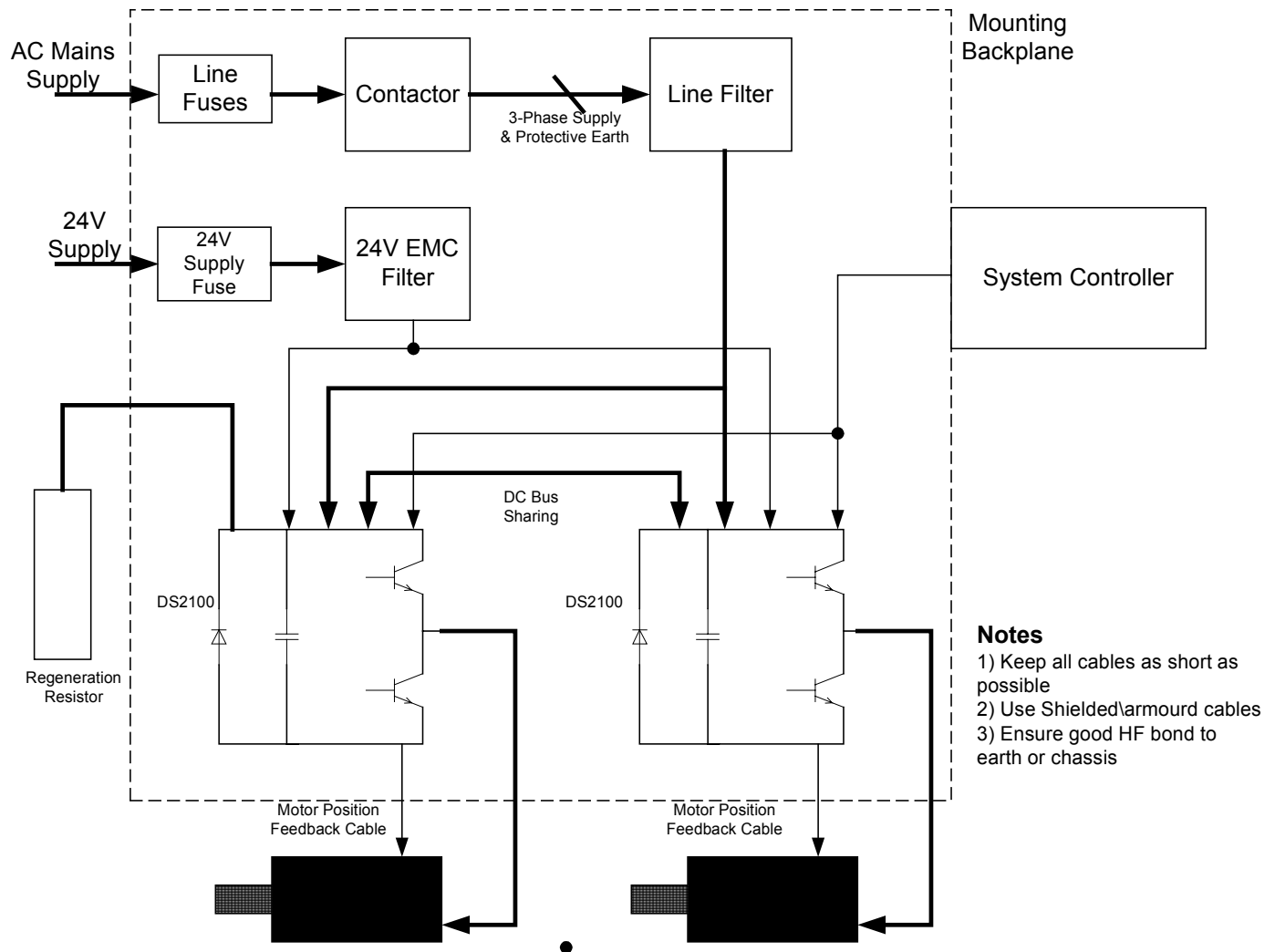


Figure 3.14 DS2100 Multi-Axis system with 3-Phase A.C. Mains Inputs

3.7.1 AC Mains Power Source Connection

3.7.1.1 Size μA

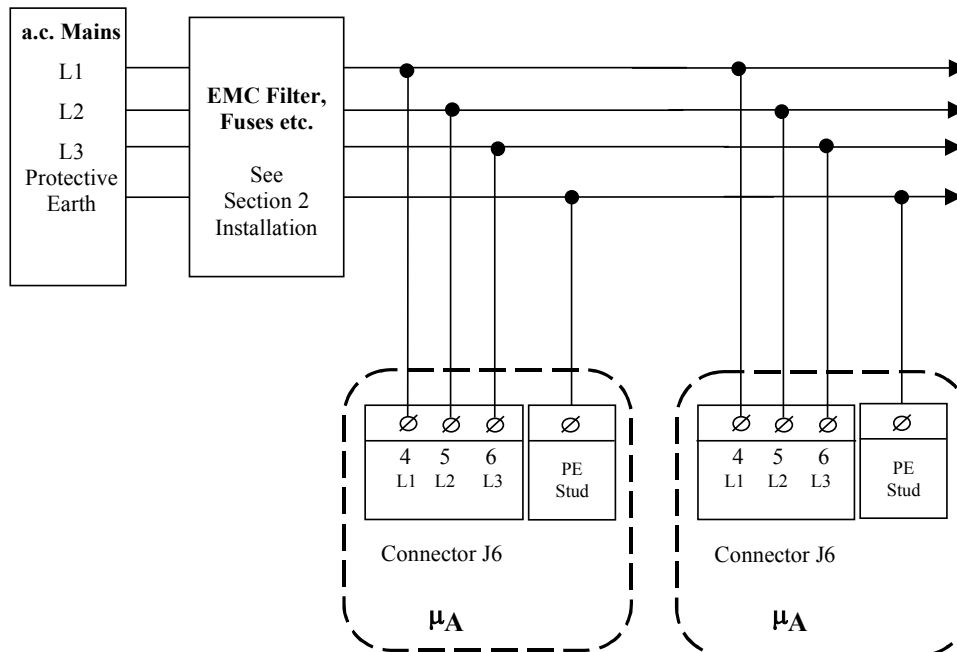


Figure 3.15 μA AC Mains Input Connection

- Fixed connector: 12 pins, male connector
- Mating connector, 12 pins, female, supplied with the drive. Phoenix Combicon (Part # GMSTB 2.5/12-ST-7.62)
- μA size wiring: cable 14 AWG (2.1 mm^2). Wire stripping: 7 mm.
- PE Stud wiring: cable 6 AWG (13 mm^2)
- Tightening torque: 0.5Nm.

Pos.	Name	Function
J6.4	L1	Phase "L1", three-phase voltage input 230/460Vac $\pm 10\%$
J6.5	L2	Phase "L2", ", three-phase voltage input 230/460Vac $\pm 10\%$
J6.6	L3	Phase "L3", ", three-phase voltage input 230/460Vac $\pm 10\%$
PE	PE	Protective Earth Stud on Chassis

Table 3.3 J6 AC Mains Power connector, μA Size

3.7.1.2 Size A & B

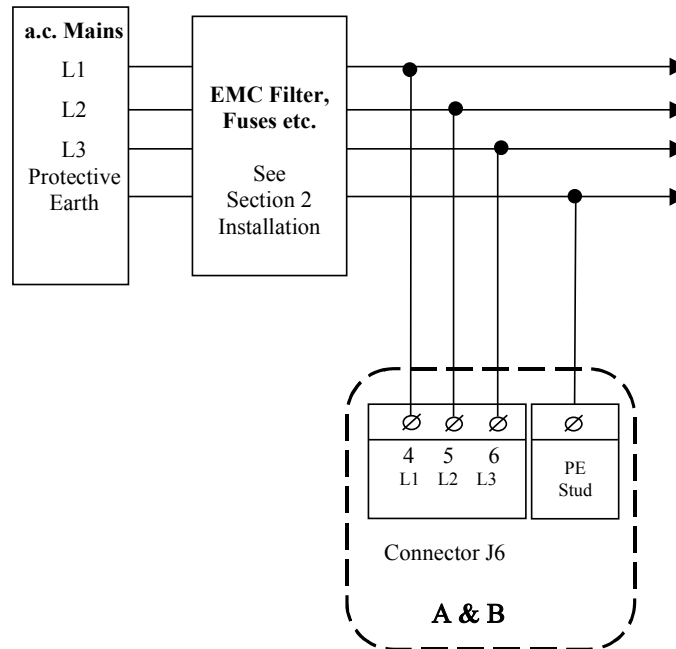


Figure 3.16 A & B AC Mains Input Connection

- Fixed connector: 10 pins, male connector
- Mating connector, 10 pins, female, supplied with the drive. Phoenix Contact (Part # PC4 HV/10-ST-7.62)
- A size wiring: cable 14AWG (2.1 mm²). Wire stripping: 7 mm
- B size wiring: cable 12AWG (3.3 mm²). Wire stripping: 7 mm
- PE Stud wiring: cable 6 AWG (13mm²)
- Tightening torque: 0.5Nm.

Pos.	Name	Function
J6.4	L1	Phase "L1", three-phase voltage input 230/460Vac ±10%
J6.5	L2	Phase "L2", ", three-phase voltage input 230/460Vac ±10%
J6.6	L3	Phase "L3", ", three-phase voltage input 230/460Vac ±10%
PE	PE	Protective Earth Stud on Chassis

Table 3.4 J6 AC Mains Power connector, A & B Size

3.7.1.3 Size C

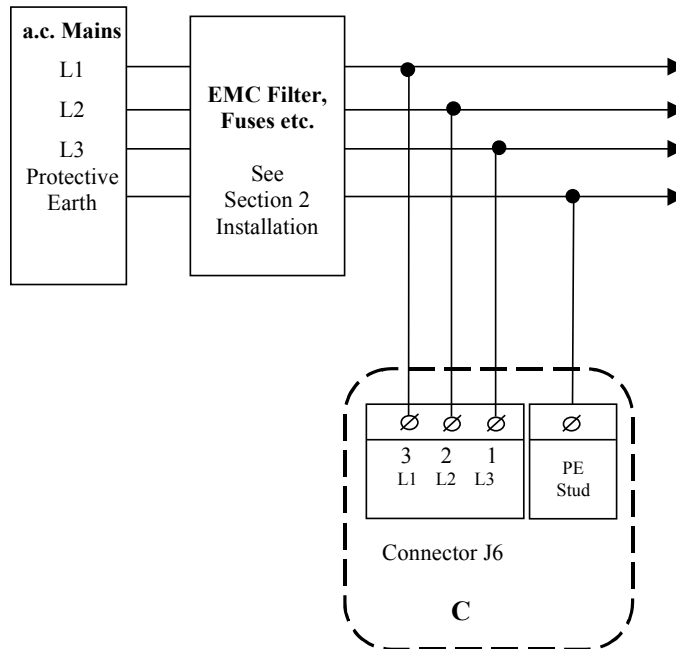


Figure 3.17 Size C AC Mains Input Connection

- Fixed connector: 5 pins, male connector
- Mating connector, 5 pins, female, crimped supplied with the drive. (Molex 42816-0512)
- C size wiring: cable 8 AWG (8.4 mm²).
- PE Stud wiring: cable 6 AWG (13mm²)

Pos.	Name	Function
J6.3	L1	Phase "L1", three-phase voltage input 230/460Vac $\pm 10\%$
J6.2	L2	Phase "L2", ", three-phase voltage input 230/460Vac $\pm 10\%$
J6.1	L3	Phase "L3", ", three-phase voltage input 230/460Vac $\pm 10\%$
PE	PE	Protective Earth Stud on Chassis

Table 3.5 J6 AC Mains Power connector, C Size

3.7.1.4 Size D

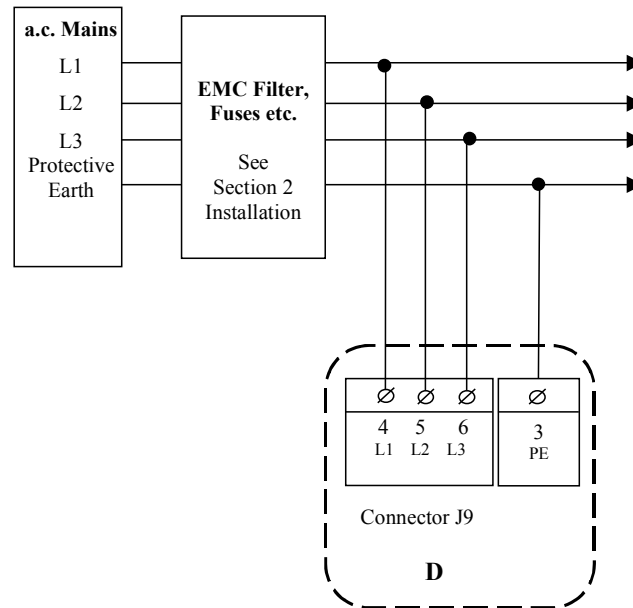


Figure 3.18 Size D AC Mains Input Connection

- Fixed connector: 4 pole, screw terminal
- D size wiring: cable 6 AWG (13 mm²) for 50/140
- D size wiring: cable 4 AWG (21mm²) for 60/180
- PE Terminal wiring: cable 6 AWG (13 mm²) for 50/140
- PE Terminal wiring: cable 4 AWG (21 mm²) for 60/180
- Stripping Length 16mm
- Tightening Torque: 2-2.3Nm

Pos.	Name	Function
J9.3	PE	Protective Earth Screw Terminal
J9.4	L1	Phase "L1", three-phase voltage input 230/460Vac $\pm 10\%$
J9.5	L2	Phase "L2", ", three-phase voltage input 230/460Vac $\pm 10\%$
J9.6	L3	Phase "L3", ", three-phase voltage input 230/460Vac $\pm 10\%$

Table 3.6 J9 AC Mains Power connector, D Size

3.7.2 Softstart & Power Cycling Frequency Limits

The DS2100 contain an internal soft-start function. The soft-start function limits the inrush current into the DS2100's D.C. Bus smoothing capacitors after the a.c. mains has been switched on.

If the frequency of power cycling becomes too high, then the power dissipation in the soft-start resistor can be excessive. In this case the softstart circuitry may become damaged.



CAUTION:- The internal softstart resistors are designed to allow an AC application of once every 60 seconds. If this rate is exceeded, then the internal softstart resistors may be damaged.

3.8 24V Backup Connection

The DS2100 is equipped with a 24V logic supply backup. This backup supply provides logic power to the drive when AC mains power is removed.

For the μ A size, this backup is mandatory for drive operation.

3.8.1 Size μ A 24V Input Connection

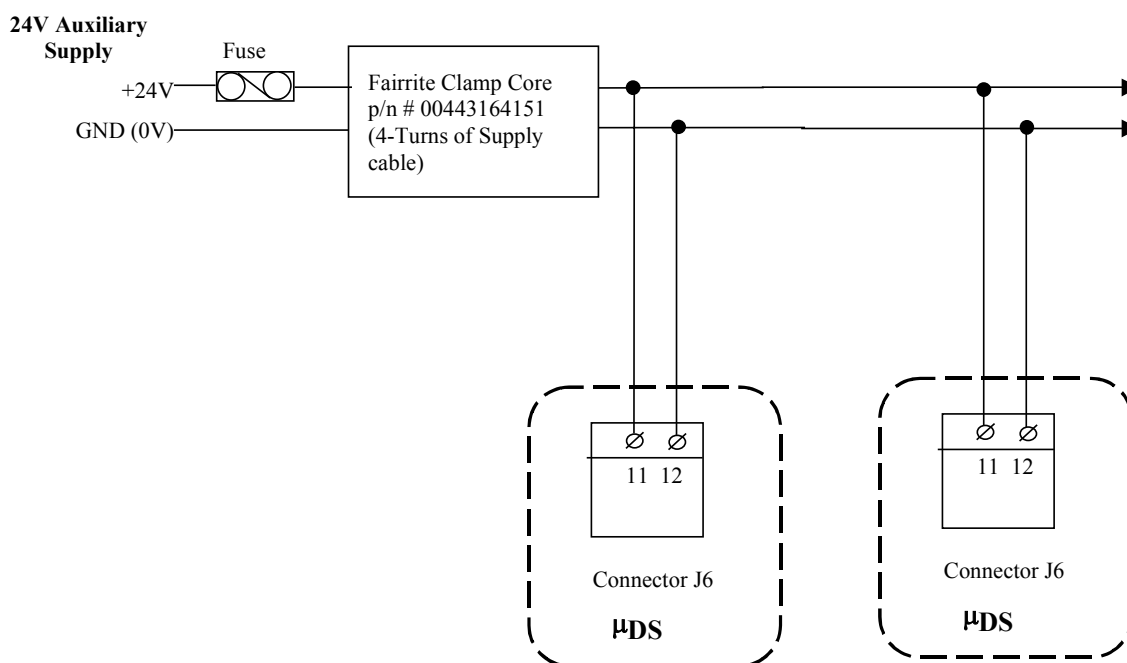


Figure 3.19 Size μ A 24V DC Input Connection

- Fixed connector: 12 pins, male connector
- Mating connector, 12 pins, female, supplied with the drive. Phoenix Combicon (Part # GMSTB 2.5/12-ST-7.62)
- μ A size wiring: cable 14 AWG (2.1 mm²).
- Stripping Length 7mm
- Tightening torque: 0.5Nm.

Pos.	Name	Function
J6.11	24V	+24V Logic Backup Supply
J6.12	0V	Logic Supply Return (Tied Internally to PE)

Table 3.7 J6 24V Logic Power connector, μ A Size

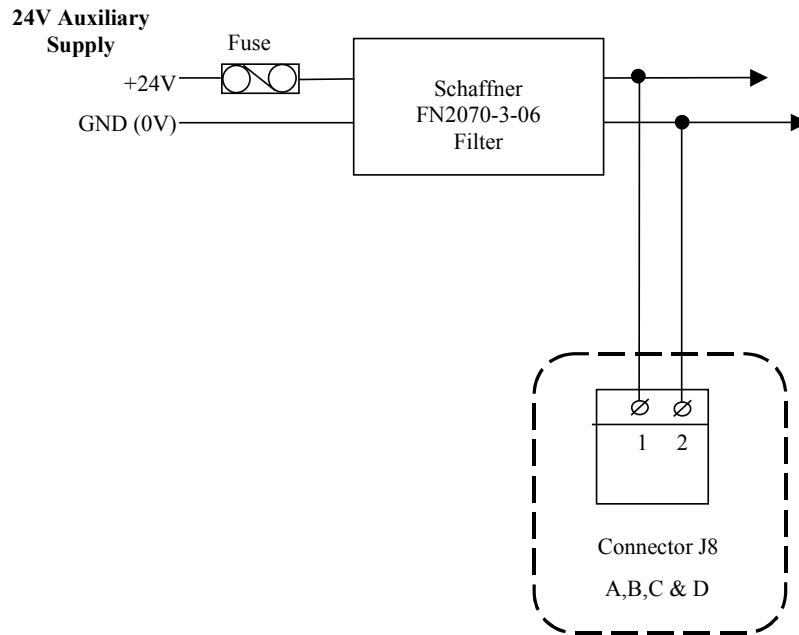
3.8.2 Size A,B,C & D 24V Input Connection

Figure 3.20 Size A,B, C & D 24V DC Input Connection

- Fixed connector: 2 pins, male connector
- Mating connector, 2 pins, female, supplied with the drive. Wago (Part # 231-102/026-000)
- A,B,C & D size wiring: cable 14 AWG (2.1 mm²).
- Stripping Length 8mm

Pos.	Name	Function
J8.1	24V	+24V Logic Backup Supply
J8.2	0V	Logic Supply Return

Table 3.8 J8 24V Logic Power connector, A,B,C & D Size

3.9 Paralleling DS2100 Units through the D.C. Bus

DS2100 units can be paralleled via the D.C. Bus, in order to share regeneration power.



To comply with the EMC Directive, the DC Bus cable must be shielded and the shield must be connected to the housing with a 360° connection at both ends.



CAUTION – To connect drives through the DC bus, please contact Moog application engineering for advice.

3.9.1 μ A Size DC Bus Inter-connection

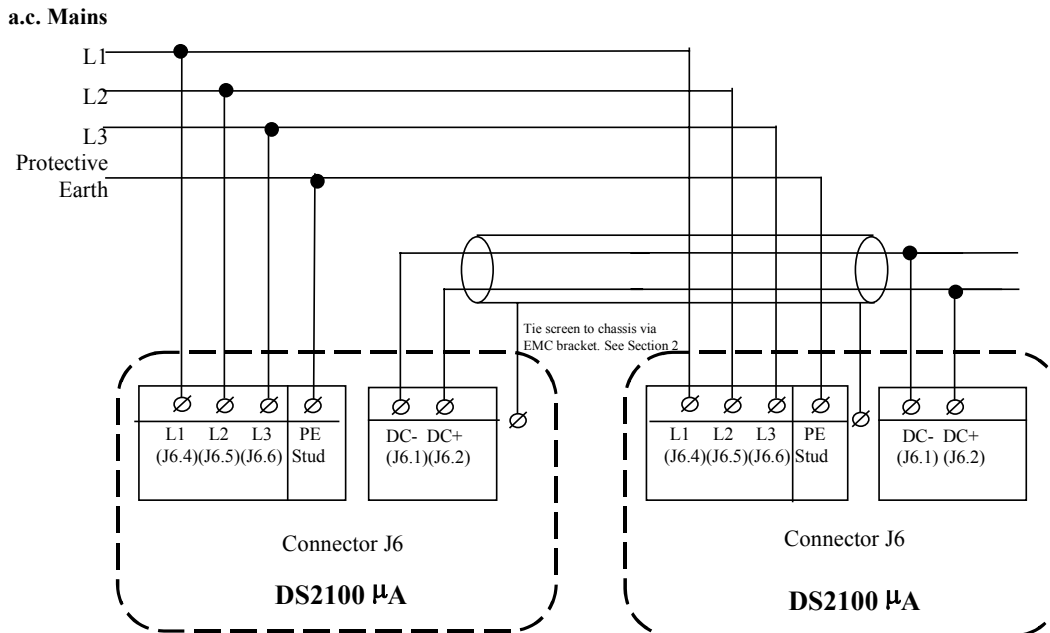


Figure 3.21 Size μ A DC Bus Inter-connection

- Fixed connector: 12 pins, male connector
- Mating connector, 12 pins, female, supplied with the drive. Phoenix Combicon (Part # GMSTB 2.5/12-ST-7.62)
- μ A size wiring: cable 14 AWG (2.1 mm^2). Wire stripping: 7 mm.
- PE Stud wiring: cable 6 AWG (13 mm^2)
- Tightening torque: 0.5Nm.

Pos.	Name	Function
J6.1	DC-	DC Bus (-)
J6.2	DC+	DC Bus (+)

Table 3.9 J6, DC Bus connector, μ A Size

3.9.2 A & B Size DC Bus Inter-connection

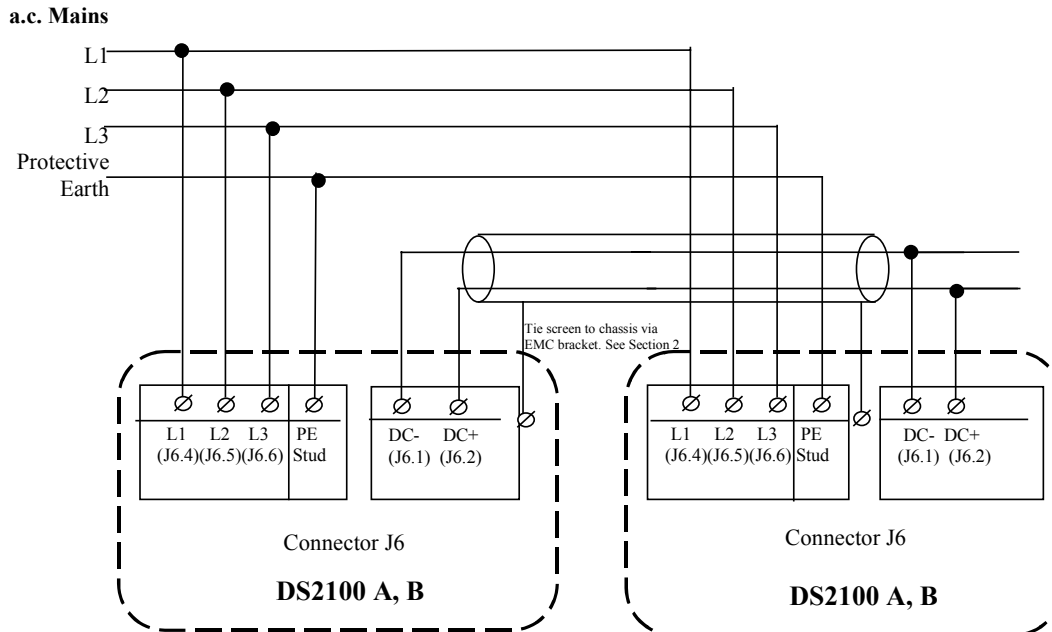


Figure 3.22 Size A, B DC Bus Inter-connection

- Fixed connector: 10 pins, male connector
- Mating connector, 10 pins, female, supplied with the drive. Phoenix Contact (Part # PC4 HV/10-ST-7.62)
- A size wiring: cable 14AWG (2.1 mm^2). Wire stripping: 7 mm
- B size wiring: cable 14AWG (2.1 mm^2). Wire stripping: 7 mm
- PE Stud wiring: cable 6 AWG (13 mm^2)
- Tightening torque: 0.5Nm.

Pos.	Name	Function
J6.1	DC-	DC Bus (-)
J6.2	DC+	DC Bus (+)

Table 3.10 J6, DC Bus connector, A,B Size

3.9.3 C Size DC Bus Inter-connection

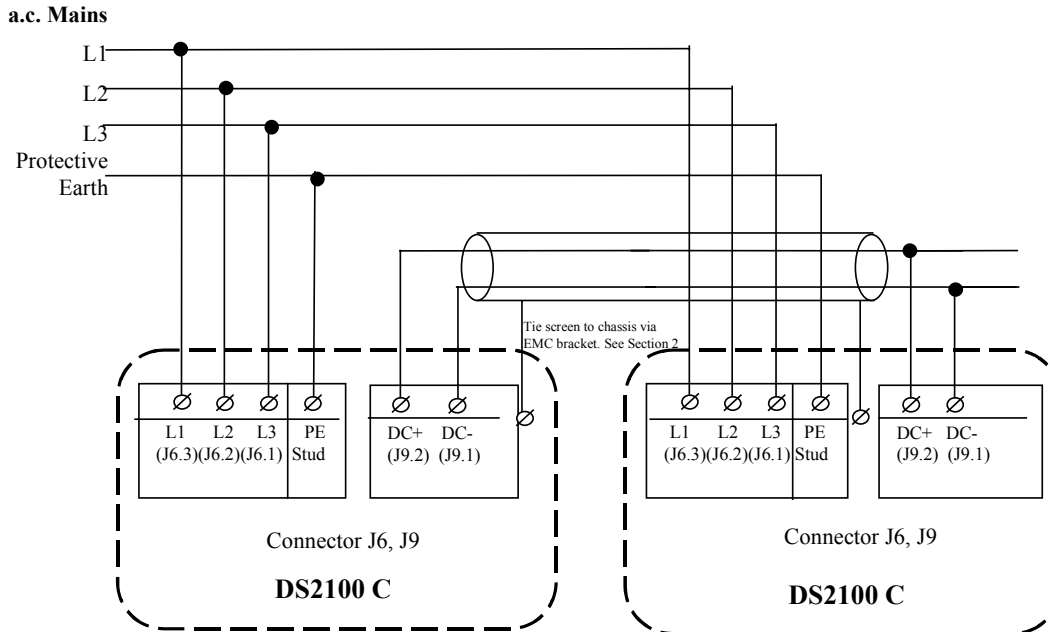


Figure 3.23 Size C DC Bus Inter-connection

J6

- Fixed connector: 5 pins, male connector
- Mating connector, 5 pins, female, crimped supplied with the drive. (Molex 42816-0512)
- C size wiring: cable 8 AWG (8.4 mm²).
- PE Stud wiring: cable 6 AWG (13mm²)

J9

- Fixed connector: 2 pins, male connector
- Mating connector, 2 pins, female, crimped supplied with the drive. (Molex 42816-0212)
- C size wiring: cable 8 AWG (8.4 mm²).

Pos.	Name	Function
J9.2	DC+	DC Bus (+)
J9.1	DC-	DC Bus (-)

Table 3.11 J9, DC Bus connector, C Size

3.9.4 D Size DC Bus Inter-connection

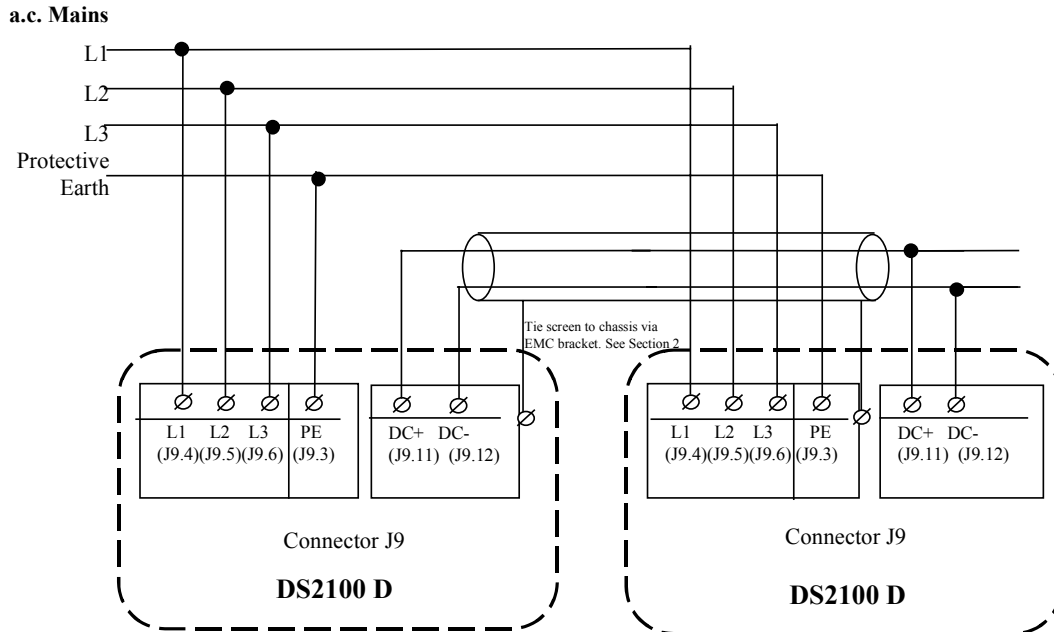


Figure 3.24 Size D DC Bus Inter-connection

J9

- Fixed connector: 2 pole, screw terminal
- D size wiring: cable 6 AWG (13 mm²) for 50/140
- D size wiring: cable 4 AWG (21mm²) for 60/180
- PE Terminal wiring: cable 6 AWG (13mm²) for 50/140
- PE Terminal wiring: cable 4 AWG (21 mm²) for 60/180
- Stripping Length 16mm
- Tightening Torque: 2-2.3Nm

Pos.	Name	Function
J9.11	DC+	DC Bus (+)
J9.12	DC-	DC Bus (-)

Table 3.12 J9, DC Bus connector, D Size

3.10 Internal/External Regeneration (Regen) Resistors – Configurations

Regeneration resistors can be fitted to all DS2100 servo-drives. All external Regen resistors should be mounted to allow adequate heat dissipation and such that heat from the Regen resistor is not directed to air intakes of other equipment. The μA size DS2100 is the only size with internal regen. All other drive sizes use external regen only.



For EMC purposes, use shielded cable to connect the external Regen resistor to the DS2100. The length of this cable should be as short as possible. The shields of these cables should be connected to Chassis Earth using the optional EMC kit or the panel earth bar. Alternatively, if the cable is required to pass through an enclosure panel earthed to Chassis Earth, the shield may be earthed to the panel by use of a 360 degree metal cable gland.

Refer to Section 2 for further safety and EMC requirements for cable installation.



NOTE - The regeneration resistor (internal and external) are protected by software. Setting the regen power and resistance parameters, allows the drive to calculate the maximum allowable duty cycle for the regen transistor. The software will clamp the regen duty-cycle at this level. If the drive tries to regen at a greater level, an overvoltage error will occur.



WARNING - External regen resistors are connected to the DS2100 D.C. Bus voltage that can reach 800 V d.c. Exposed metallic mounting parts of external regen resistors must be connected to protective earth and the electrically conducting parts mechanically shielded for safety. High voltage warning stickers are also recommended.

DS2100 Regeneration Resistor Options						
Model (Size)	Internal Regen			External Regen		
	Resistance (Ω)	Continuous Power (W)	Peak Power (@ 400V _{AC}) (kW)	Resistance (Ω)	Continuous Power (W)	Peak Power (@ 400V _{AC}) (kW)
G361-x003 (μA)	120	50	4.8	120	50	4.8
G361-x006 (μA)	120	100	4.8	120	100	4.8
G361-x008 (A)	Internal Regen is available only on the DS2100 μA Size.			51	200	12.5
G361-x014 (B)				33	250	19.4
G361-x020 (C)				12	370	53.3
G361-x025 (C)				12	370	53.3
G361-x030 (C)				12	370	53.3
G361-x050 (D)				10	750	64
G361-x060 (D)				10	750	64

Table 3.13 Recommended Regeneration Resistors

3.10.1 μ A Size Regeneration Resistor Connection

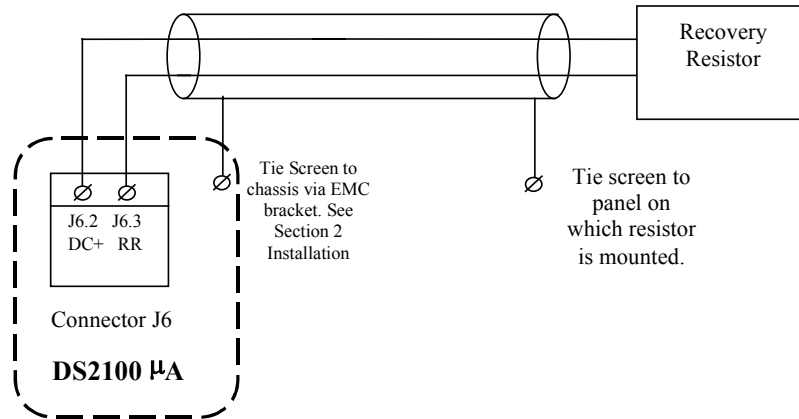


Figure 3.25 DS2100 Size μ A External Regeneration Connections

- Fixed connector: 12 pins, male connector
- Mating connector, 12 pins, female, supplied with the drive. Phoenix Combicon (Part # GMSTB 2.5/12-ST-7.62)
- μ A size wiring: cable 14 AWG (2.1 mm²). Wire stripping: 7 mm.
- Tightening torque: 0.5Nm.

Pos.	Name	Function
J6.2	DC+	DC Bus (+)
J6.3	RR	Regeneration Resistor

Table 3.14 J6, Regeneration Resistor connector, μ A Size

3.10.2 A, B Size Regeneration Resistor connection

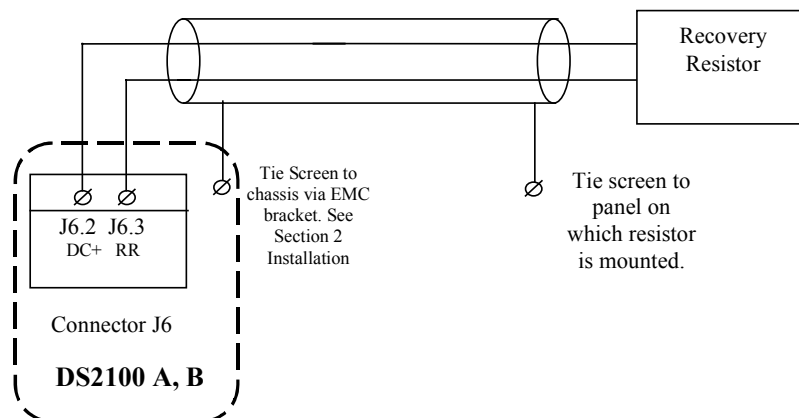


Figure 3.26 DS2100 Size A,B External Regeneration Connections

- Fixed connector: 10 pins, male connector
- Mating connector, 10 pins, female, supplied with the drive. Phoenix Contact (Part # PC4 HV/10-ST-7.62)
- A size wiring: cable 14AWG (2.1 mm²). Wire stripping: 7 mm
- B size wiring: cable 14AWG (2.1 mm²). Wire stripping: 7 mm
- Tightening torque: 0.5Nm.

Pos.	Name	Function
J6.2	DC+	DC Bus (+)
J6.3	RR	Regeneration Resistor

Table 3.15 J6, Regeneration Resistor connector, A,B Size

3.10.3 C Size Regeneration Resistor connection

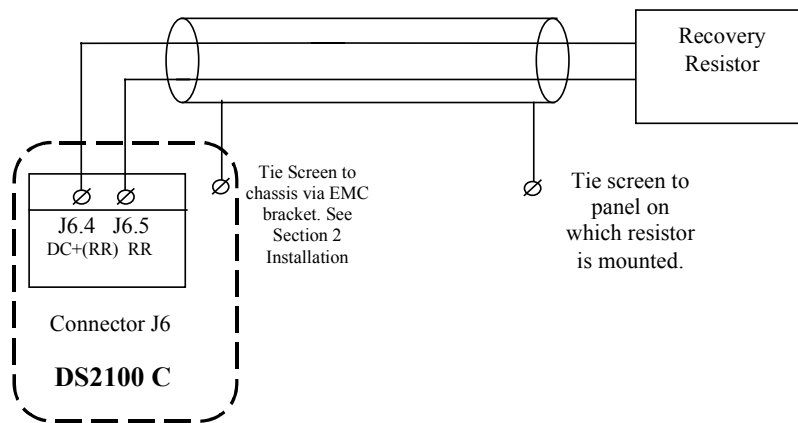


Figure 3.27 DS2100 Size C External Regeneration Connections

- Fixed connector: 5 pins, male connector
- Mating connector, 5 pins, female, crimped supplied with the drive. (Molex 42816-0512)
- C size wiring: cable 8 AWG (8.4 mm²).

Pos.	Name	Function
J6.4	DC+(RR)	DC Bus (+)
J6.5	RR	Regeneration Resistor

Table 3.16 J6, Regeneration Resistor connector, C Size

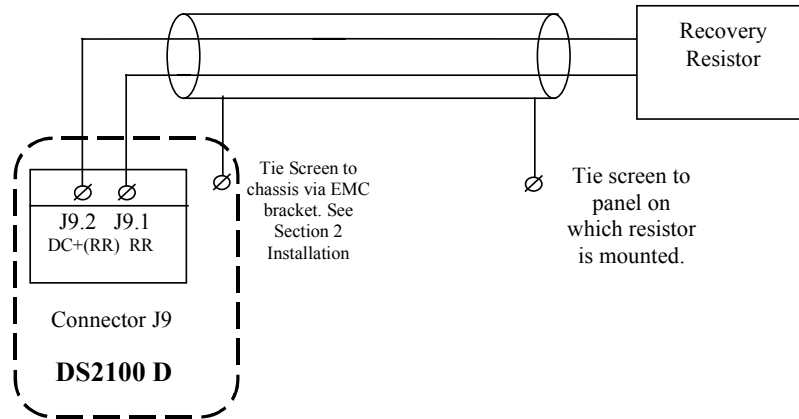
3.10.4 D Size Regeneration Resistor connection

Figure 3.28 DS2100 Size D External Regeneration Connections

J9

- Fixed connector: 2 pole, screw terminal
- D size wiring: cable 6 AWG (13 mm²) for 50/140
- D size wiring: cable 4 AWG (21mm²) for 60/180
- Stripping Length 16mm
- Tightening Torque: 2-2.3Nm

Pos.	Name	Function
J9.1	RR	Regeneration Resistor
J9.2	DC+(RR)	DC Bus (+)

Table 3.17 J9, Regeneration Resistor connector, D Size



WARNING - When performing any changes to the regen resistor configuration, a.c. input power must be removed from the DS2100. Wait 5 minutes upon removal of all power, to allow for D.C. Bus capacitors to discharge.

3.11 Motors - Installation

Motors should be sized by qualified personnel. Improper sizing will directly affect performance and reliability.

Motor performance data for Moog motors is shown in separate data sheets. Contact Moog Applications Engineering for detailed motor technical information and application sizing, etc.

Standard motors should not be mounted directly onto a gearbox with the shaft inside the lubrication chamber. Motors may be ordered with an optional shaft seal for these applications. When the motor is mounted, the lubricant level within the gearbox must be below the shaft seal of the motor in order to avoid long term seepage and motor failure.

3.11.1 Assembling Motor Resolver and Power Cables

Use of the made-up cable sets is recommended for connecting the MOOG brushless servomotors. These cable sets are available in standardized lengths.

If MOOG cables are not used, the values specified below with regard to the cable make-up must be maintained **in all cases**.

Contact your local Moog sales office or authorised distributor for selection of pre-made motor cables.

The following are listed for convenience:-

Europe and Asia

MOOG GmbH
Hanns-Klemm-Strasse 28
71034 Boeblingen
GERMANY
phone: +0049 - 7031 - 622 -0
fax: +0049 - 7031 - 622 - 100

North America

MOOG INC
Jamison Road
East Aurora, NY 14052
USA
phone: +001 - 716 - 652 - 2000
fax: +001 - 716 - 687 - 4870

Italy

MOOG Italiana S.r.l.
Electric Division
Via Avossa 94
16015 Casella (Gevova)
Italy
phone: +0039 - 010 - 96711
fax: +0039 - 010 - 9671280

3.11.2 Motor Power Cable

Wire the motor power connector in accordance with Figure 3.29 to Figure 3.35.

Use wire sizes based on the motor's continuous stall current (r m s) and wire length requirements.



Wiring must be in accordance with standard EN 60204-1 (See Section 2 of this Users Manual.)

For proper drive commutation of motors, it is required that the motor phase conductors, Phase U, Phase V, and Phase W be wired exactly.

3.11.2.1 Size μ A

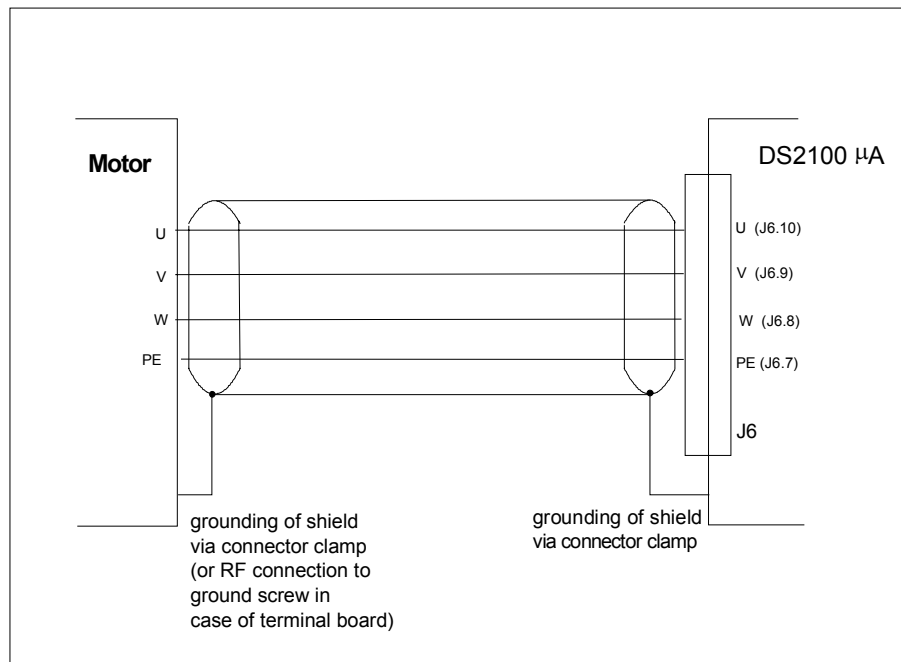


Figure 3.29 DS2100 μ A Motor Power Connection

- Fixed connector: 12 pins, male connector
- Mating connector, 12 pins, female, supplied with the drive. Phoenix Combicon (Part # GMSTB 2.5/12-ST-7.62)
- μ A size wiring: cable 14 AWG (2.1 mm^2). Wire stripping: 7 mm.
- Tightening torque: 0.5Nm.

Pos.	Name	Function
J6.7	PE	Motor Protective Earth
J6.8	W	Motor Phase W
J6.9	V	Motor Phase V
J6.10	U	Motor Phase U

Table 3.18 J6, Motor connector, μ A Size

3.11.2.2 Size A, B

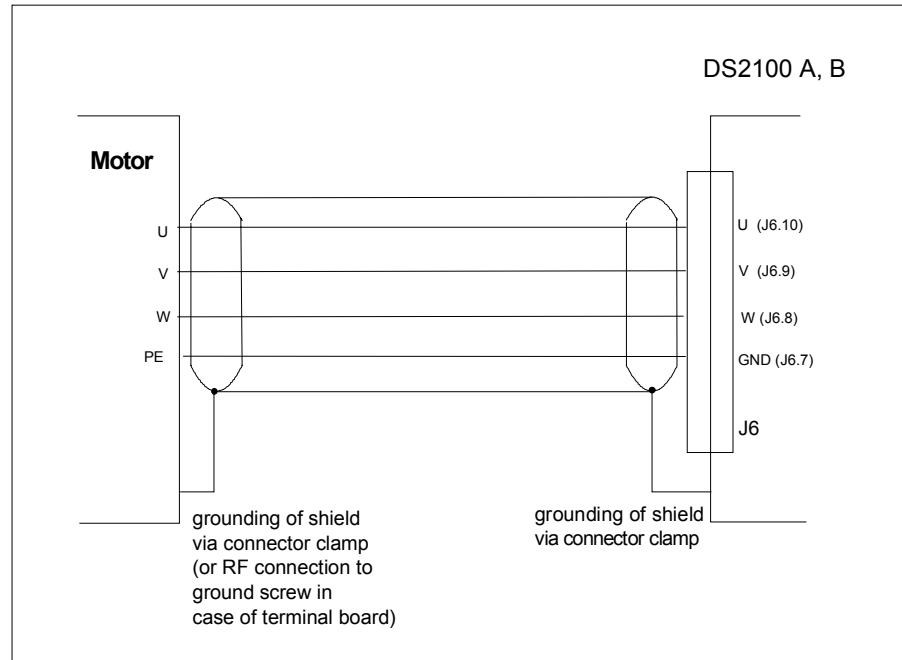


Figure 3.30 DS2100 A, B Motor Power Connection

- Fixed connector: 10 pins, male connector
- Mating connector, 10 pins, female, supplied with the drive. Phoenix Contact (Part # PC4 HV/10-ST-7.62)
- A size wiring: cable 14AWG (2.1 mm²). Wire stripping: 7 mm
- B size wiring: cable 12AWG (3.3 mm²). Wire stripping: 7 mm
- Tightening torque: 0.5Nm.

Pos.	Name	Function
J6.7	GND	Motor Protective Earth
J6.8	W	Motor Phase W
J6.9	V	Motor Phase V
J6.10	U	Motor Phase U

Table 3.19 J6, Motor connector, A,B Size

3.11.2.3 Size C

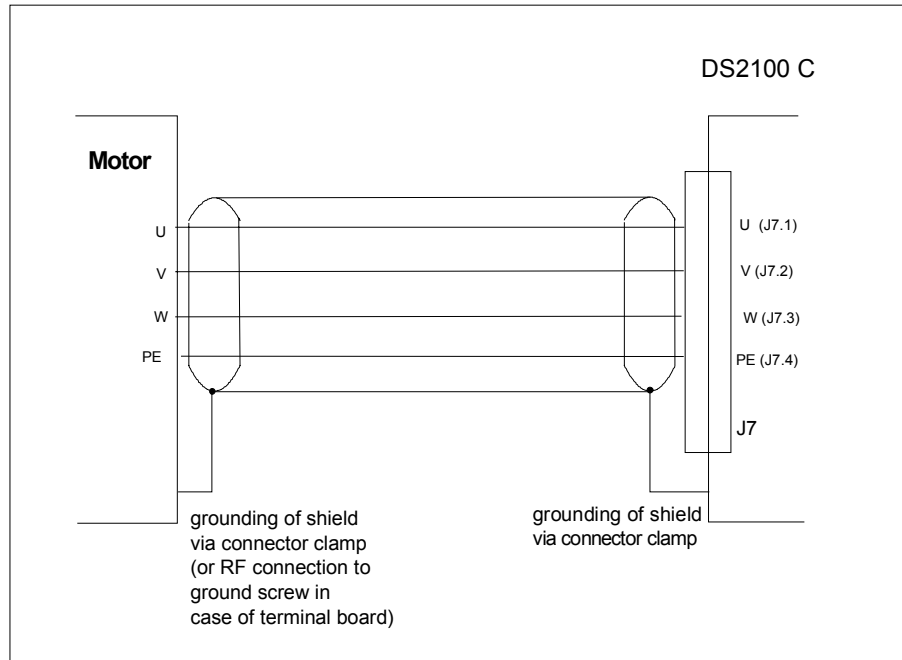


Figure 3.31 DS2100 C Motor Power Connection

- Fixed connector: 4 pins, male connector
- Mating connector, 4 pins, female, crimped supplied with the drive. (Molex 42816-0412)
- C size wiring: cable 8 AWG (8.4 mm²).

Pos.	Name	Function
J7.4	PE	Motor Protective Earth
J7.3	W	Motor Phase W
J7.2	V	Motor Phase V
J7.1	U	Motor Phase U

Table 3.20 J7, Motor connector, C Size

3.11.2.4 Size D

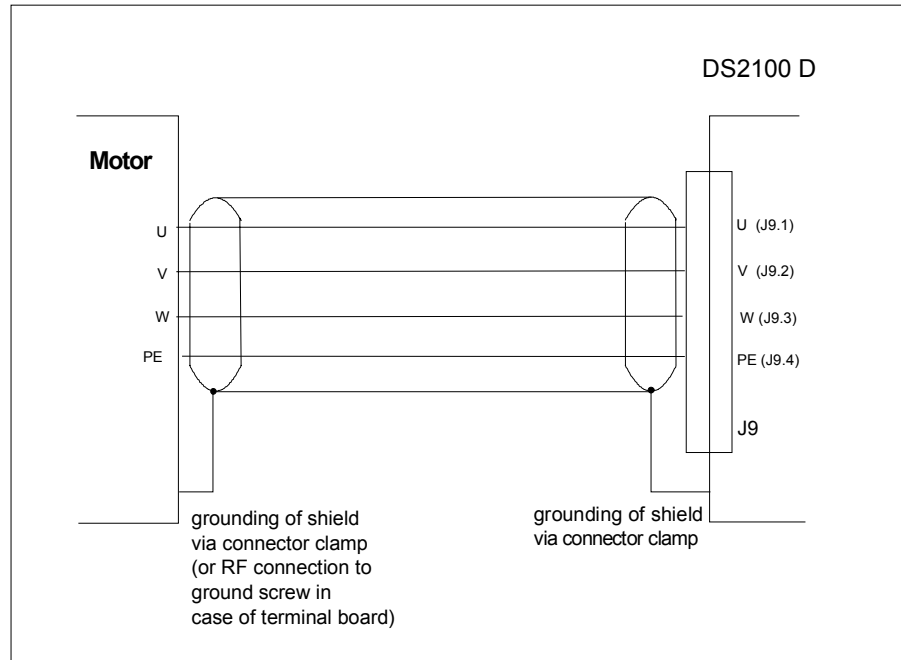


Figure 3.32 DS2100 D Motor Power Connection

J9

- Fixed connector: 4 pole, screw terminal
- D size wiring: cable 6 AWG (13 mm²) for 50/140
- D size wiring: cable 4 AWG (21mm²) for 60/180
- Stripping Length 16mm
- Tightening Torque: 2-2.3Nm

Pos.	Name	Function
J9.10	PE	Motor Protective Earth
J9.9	W	Motor Phase W
J9.8	V	Motor Phase V
J9.7	U	Motor Phase U

Table 3.21 J9, Motor connector, D Size

3.11.3 Motor Brake Connection

The DS2100 provides a motor break relay at connector J2D (on Control Card Interface). The user supplies a 24Vd.c., Power Supply Unit for the brake connections. Details of the motor brake current requirements are available from the relevant motor datasheet.

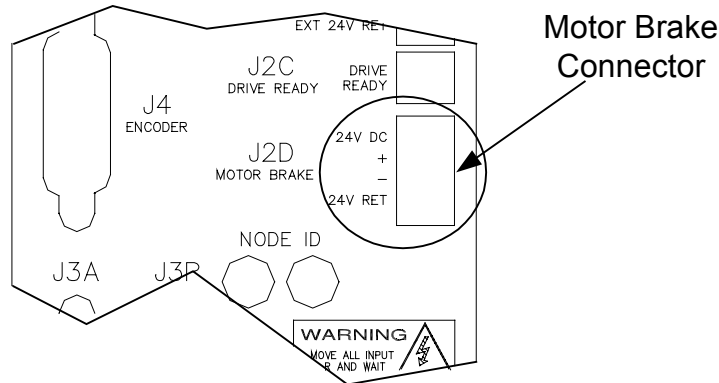


Figure 3.33 Motor Brake Connector Location

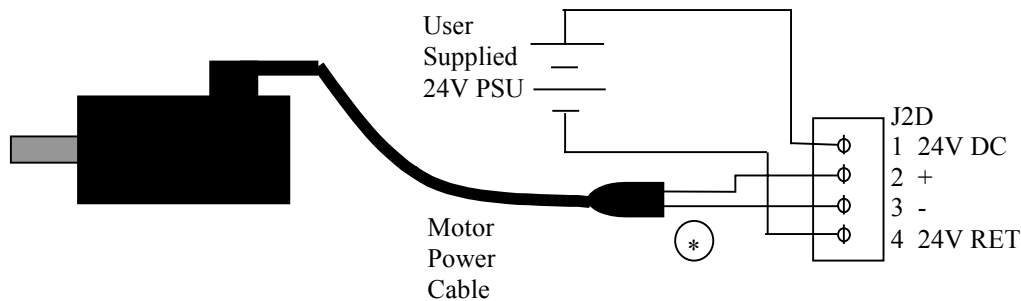


Figure 3.34 Motor Brake Cabling

- Fixed connector: 4 pins, male connector
- Mating connector, 4 pins spring cage, female, supplied with the drive. Phoenix Contact (Part # FK-MCP 1.5/4-ST-3.81)
- Wiring: cable. 28-16AWG (0.14-1.5mm²)
- Wire stripping: 9 mm

Pos.	Name	Function
J2D.1	24V DC	Brake 24V Supply
J2D.2	+	Brake +
J2D.3	-	Brake -
J2D.4	24V RET	Brake 24V Supply Return

Table 3.22 J2D, DS2100 Brake connector

* The pins of the brake terminals at the motor cable connector end depend upon the cable size. Refer to Figure 3.35 for details.

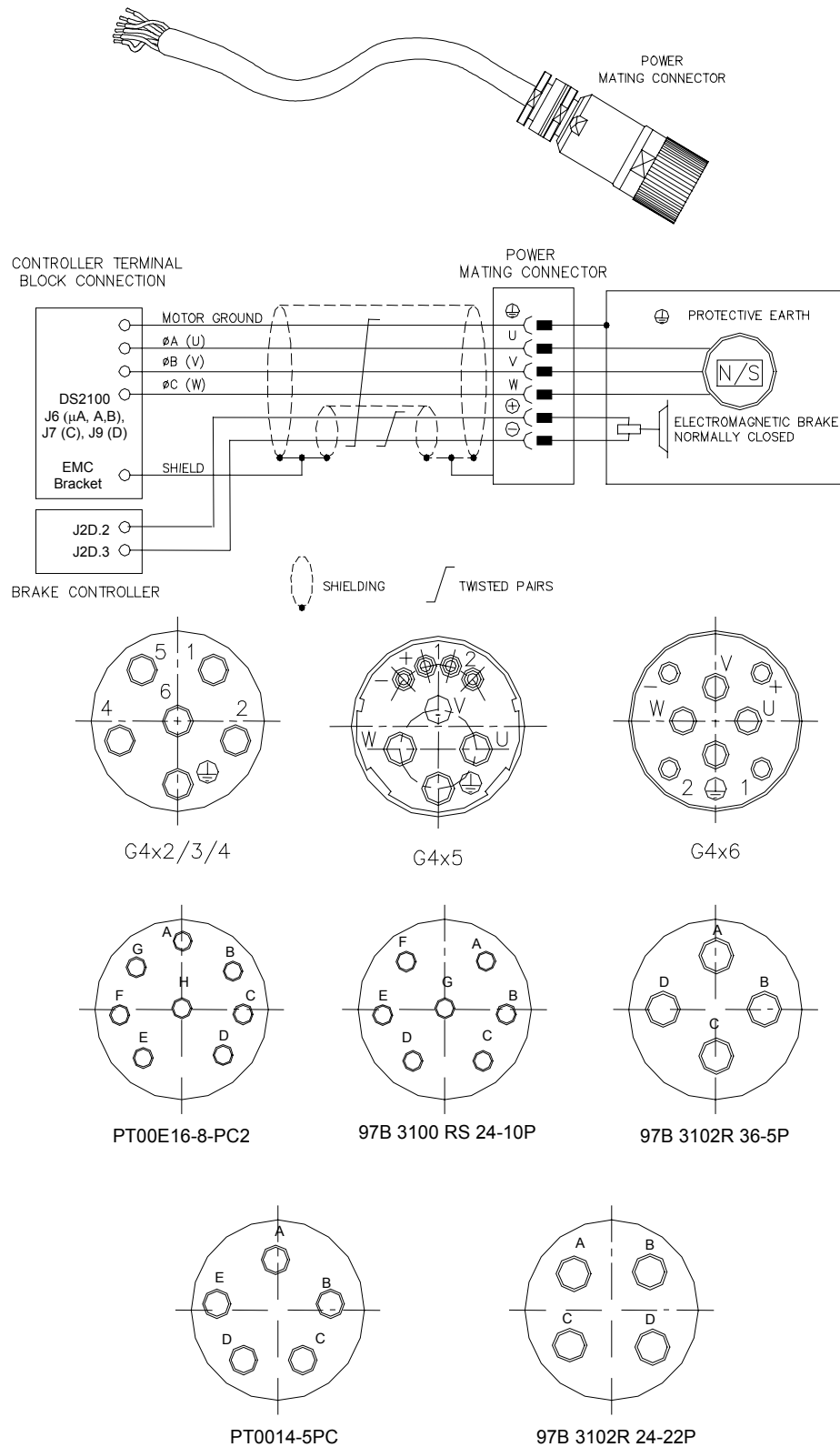


Figure 3.35 Motor Power and Brake Connectors





DS2100	G4x2/3/4	G4x5	G4x6	PT00E 16- 8-PC2	97B3100R S 24-10P	97B3102R 36-SP	PT00E 14- 5 PC	97B3102R S 24-22P
				D	D	D	D	D
U	2	U	U	A	A	A	A	A
V	4	V	V	B	B	B	B	B
W	1	W	W	C	C	C	C	C
Brake+	5	+	+	E	E	-	-	-
Brake-	6	-	-	F	F	-	-	-

Table 3.23 Motor Power Connections

3.11.4 Motor Resolver Connection

Wire the DS2100 resolver cable in accordance with Figure 3.37 and Table 3.24.



For CE compliance, shield should be attached on both sides of resolver cable.

i

NOTE:- Avoid running the resolver cable near other high power wiring, especially the motor power cable, if possible.

i

NOTE:- Cable Length should not exceed 30m (100 feet).

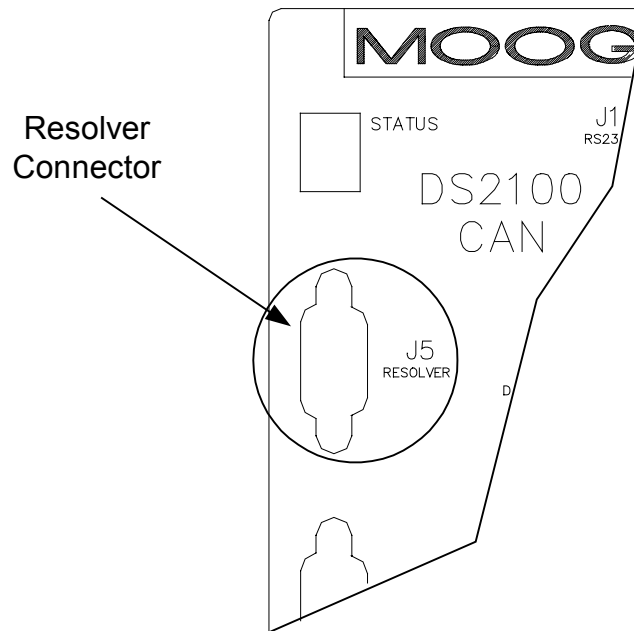


Figure 3.36 Motor Resolver Connector Location

- Fixed connector: 9 pin, female Sub-D connector
- Mating connector, 9 pin male Sub-D
- Wiring: cable. 28-18AWG (0.14-0.82mm²)

MOTOR RESOLVER CONNECTOR				
Pos	Signal Type	FAS T/ FAS K	FAS N/ FAS Y	G4xx (FASG)
J5.1	$\cos\varphi$ (S2)	C	1	3
J5.2	$\overline{\cos\varphi}$ (S4)	E	2	4
J5.9	V-Ref (R1)	D	10	7
J5.7	0V (R2)	B	7	8
J5.8	PTC\NTC	N	8	6
J5.6	PTC\NTC	A	9	5
J5.4	$\sin\varphi$ (S1)	G	11	1
J5.5	$\overline{\sin\varphi}$ (S3)	H	12	2
J5.3	Shield	S	3	-

Table 3.24 Resolver connections to motor

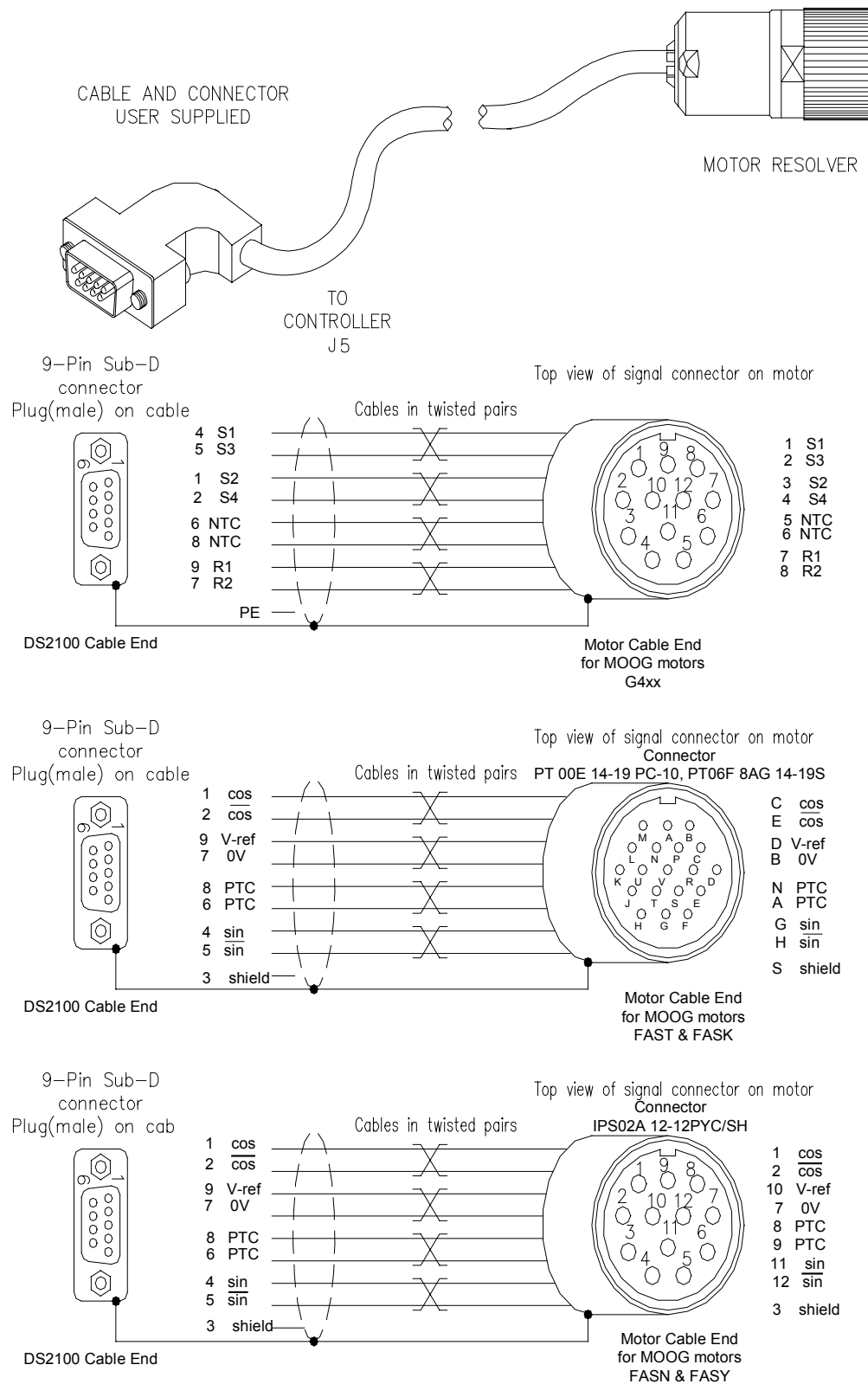


Figure 3.37 DS2100 Resolver Cables

3.11.5 Motor Encoder Connection

The DS2100 encoder input supports a variety of encoders. These include Analogue, SSI, Hiperface and Endat. The connections to the drive for each of these encoder types are given in Table 3.25.

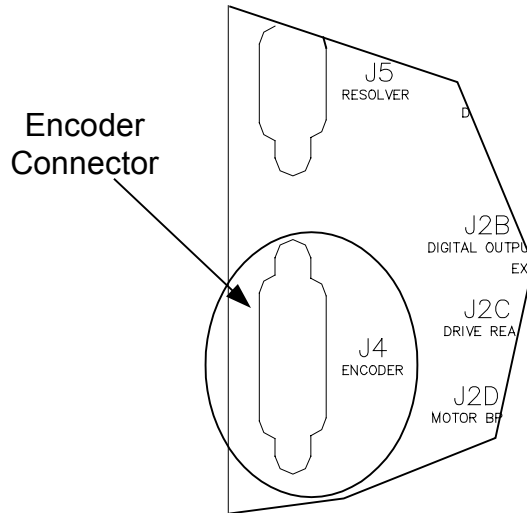


Figure 3.38 Motor Encoder Connector Location

- Fixed connector: 15 pin, female Sub-D connector
- Mating connector, 15pin male Sub-D
- Wiring: cable. 28-18AWG (0.14-0.82mm²)

Pos	Encoder Type			
	Analogue	SSI	Hiperface	Endat
J4.1	Shield	Shield	Shield	Shield
J4.2	- Sine	-	- Sine	- Channel A
J4.3	- Cosine	-	- Cosine	- Channel B
J4.4	Gnd Supply	Gnd Supply	Gnd Supply	Gnd Supply
J4.5	- Channel Z (Zero)	- Data	RS485 -	- Data
J4.6	-	- Clock	-	- Clock
J4.7	-	-	-	-
J4.8	NTC/PTC	NTC/PTC	NTC/PTC	NTC/PTC
J4.9	+ Sine	-	+ Sine	+ Channel A
J4.10	+ Cosine	-	+ Cosine	+ Channel B
J4.11	+5 V .. +12V Supply (150 mA max.)	+5 V .. +12V Supply (150 mA max.)	+5 V .. +12V Supply (150 mA max.)	+5 V .. +12V Supply (150 mA max.)
J4.12	+ Channel Z (Zero)	+ Data	RS485 +	+ Data
J4.13	- Fault	+ Clock	-	+ Clock
J4.14	Gnd Supply	Gnd Supply	Gnd Supply	Gnd Supply
J4.15	NTC/PTC	NTC/PTC	NTC/PTC	NTC/PTC

Table 3.25 Encoder Cable Input Connections



For CE compliance, shield should be attached on both sides of encoder cable.

i

NOTE:- Avoid running the encoder cable near other high power wiring, especially the motor power cable, if possible.

i

NOTE:- Cable Length should not exceed 30m (100 feet).

3.11.6 Motor Rotation Direction

The positive direction of rotation is clockwise, when the motor is viewed from the shaft end, as shown in the diagram below.

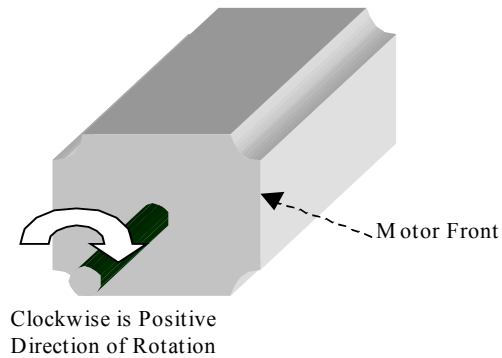


Figure 3.39 Rotational Convention for Mechanical Process Variables

i

NOTE:- For operation with the encoder, positive rotation as defined here corresponds to Channel A **leading** Channel B.

3.12 DS2100 Control Input and Outputs

The following section contains a description of the control related Input/Output (I/O) available to the user. Functionality of this I/O is detailed later in this manual.

i

NOTE - An external 12Vd.c. to 32Vd.c. power source (user supplied) is required for the I/O functions. The amperage rating of this power source will depend on the number of I/O functions used. Supply currents can be calculated as a function of this number and the input and output impedances quoted below.

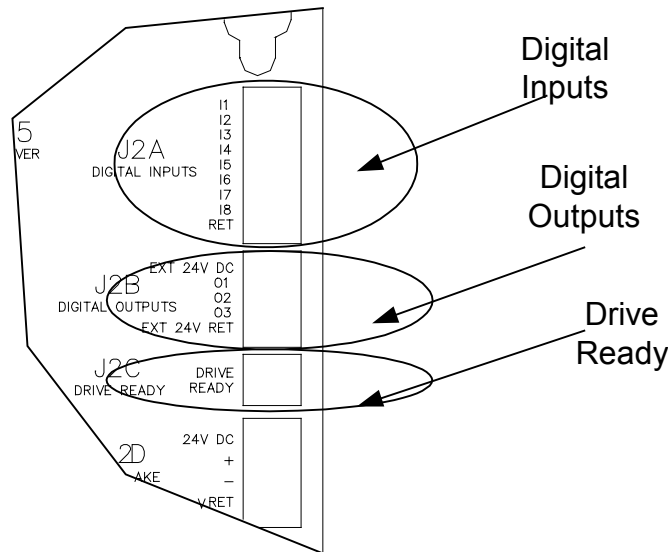


Figure 3.40 DS2100 I/O Connections

3.12.1 General Purpose Description of the Digital Inputs

The DS2100 provides 8 digital inputs on connector J2A.

- Fixed connector: 9 pins, male connector
- Mating connector, 9 pins spring cage, female, supplied with the drive. Phoenix Contact (Part # FK-MC 0.5/9-ST-2.5)
- Wiring: cable. 28-20AWG (0.14-0.5mm²)
- Wire stripping: 8 mm

Pos.	Name	Function	
J2A.1	I1	Digital Input # 1	Drive Enable
J2A.2	I2	Digital Input # 2	User Configurable
J2A.3	I3	Digital Input # 3	User Configurable
J2A.4	I4	Digital Input # 4	User Configurable
J2A.5	I5	Digital Input # 5	User Configurable
J2A.6	I6	Digital Input # 6	User Configurable
J2A.7	I7	Digital Input # 7	User Configurable
J2A.8	I8	Digital Input # 8	User Configurable
J2A.9	RET	Digital Input Ground	

Table 3.26 J2A, DS2100 Digital Input connector

The following electrical description applies to all the digital inputs of the DS2100.

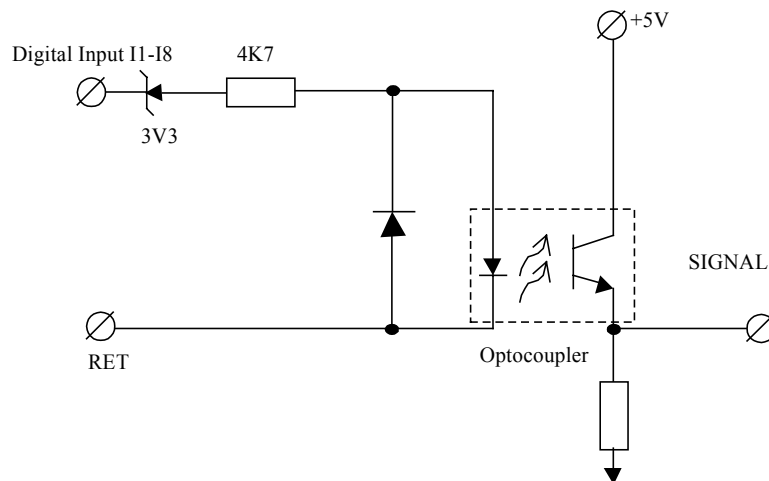


Figure 3.41 DS2100 Generic Digital Inputs

Note that:-

- Input Impedance > **5k Ω** .
- Voltage Range is **12V to 32V** from Digital-Input to the I_COMMON line. Inputs are protected for input voltages from -40V to +40V
 - Input voltages whose magnitude is less than 12V with respect to the I_COMMON line will not be guaranteed to be recognised as an **active** signal input.
 - Input voltages whose magnitude is more than 5V with respect to the I_COMMON line will not be guaranteed to be recognised as an **inactive** signal input
- **All digital inputs are optically isolated** for noise immunity purposes. All DS2100 digital inputs are isolated from high voltage circuitry internally
- **Current flowing** in the digital input implies the '**safer**' of the corresponding active/inactive functions. For example, when current flows in the clockwise limit switch input, then the limit is NOT active.

3.12.2 General Purpose Description of the Digital Outputs

The DS2100 provides 4 digital outputs on connector J2B & J2C. Only the digital outputs on J2B are detailed here.

- Fixed connector: 5 pins, male connector
- Mating connector, 5 pins spring cage, female, supplied with the drive. Phoenix Contact (Part # FK-MC 0.5/5-ST-2.5)
- Wiring: cable. 28-20AWG (0.14-0.5mm²)
- Wire stripping: 8 mm

Pos.	Name	Function	
J2B.1	Ext 24V DC	+24V Digital Output Supply	
J2B.2	O1	Digital Output #1	User Configurable
J2B.3	O2	Digital Output #2	User Configurable
J2B.4	O3	Digital Output #3	User Configurable
J2B.5	Ext 24V Ret	Digital Output Return	

Table 3.27 J2B, DS2100 Digital Output connector

The following electrical description applies to all, except one, of the digital outputs of the DS2100. (One digital output, Drive Ready, uses a relay rather than an opto-coupler).

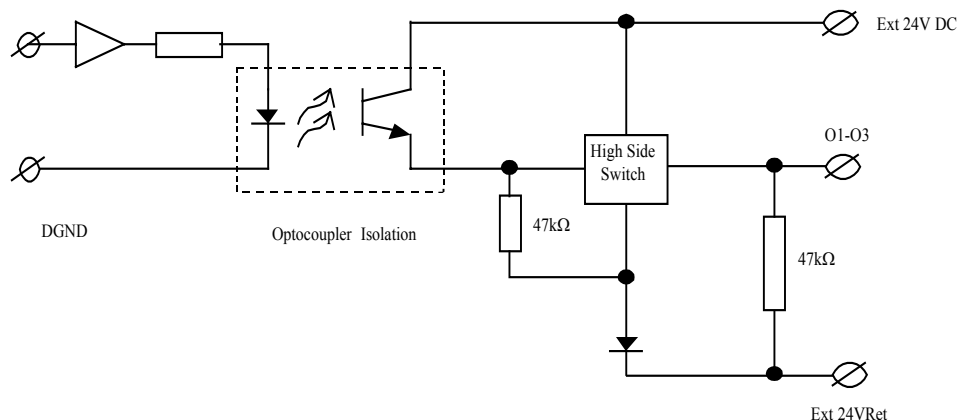


Figure 3.42 DS2100 Generic Digital Outputs

Note that:-

- **Voltage Range** is 6V to 32V from Digital-Output to the O_COMMON line. Digital outputs switch only DC voltages.
- **Output current** ≥ 250 mA, off state leakage current ≤ 100 μ A at 0 V.
- **Short circuit** protected, inductive load driving capability, reverse polarity protected. Protected for supply voltage range of -40 V to +40 V.
- **All digital outputs are optically isolated** for noise immunity purposes. All DS2100 digital outputs are isolated from high voltage circuitry.
- **Current flowing** in the digital output implies the function is active.

3.12.2.1 Drive Ready Relay

The DS2100 provides 1 relay outputs on connector J2C. This relay closes when the drive is ready and no faults are present.

- Fixed connector: 2 pins, male connector
- Mating connector, 2 pins spring cage, female, supplied with the drive. Phoenix Contact (Part # FK-MC 0.5/2-ST-2.5)
- Wiring: cable. 28-20AWG (0.14-0.5mm²)
- Wire stripping: 8 mm

Pos.	Name	Function
J2C.1	Drive Ready 1	Drive ready relay contact pin 1
J2C.2	Drive Ready 2	Drive ready relay contact pin 1

Table 3.28 J2B, DS2100 Digital Output connector

The following electrical description applies to the Drive ready relay of the DS2100.

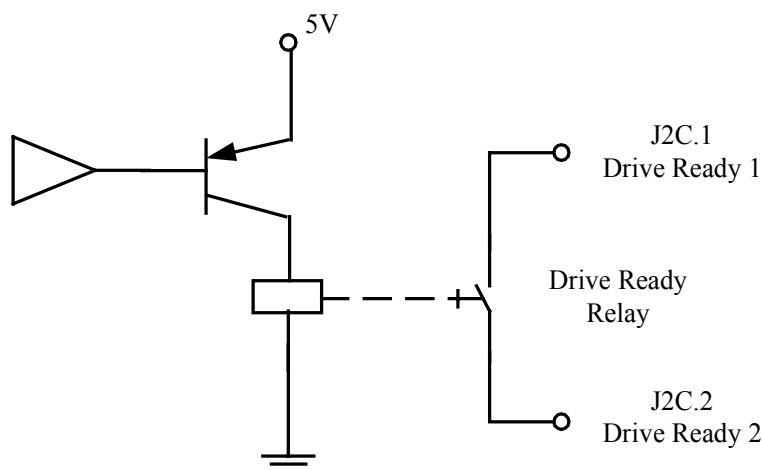


Figure 3.43 Drive Ready Relay Output

Note that:-

- **Closed** when drive ready and no faults.
- **Max.** voltage 36 V
- **Max.** contact current 100 mA

3.12.3 Power Sequencing on Startup

The timing of the digital inputs ENABLE and PWR_RDY must be considered carefully for proper power-on sequencing.

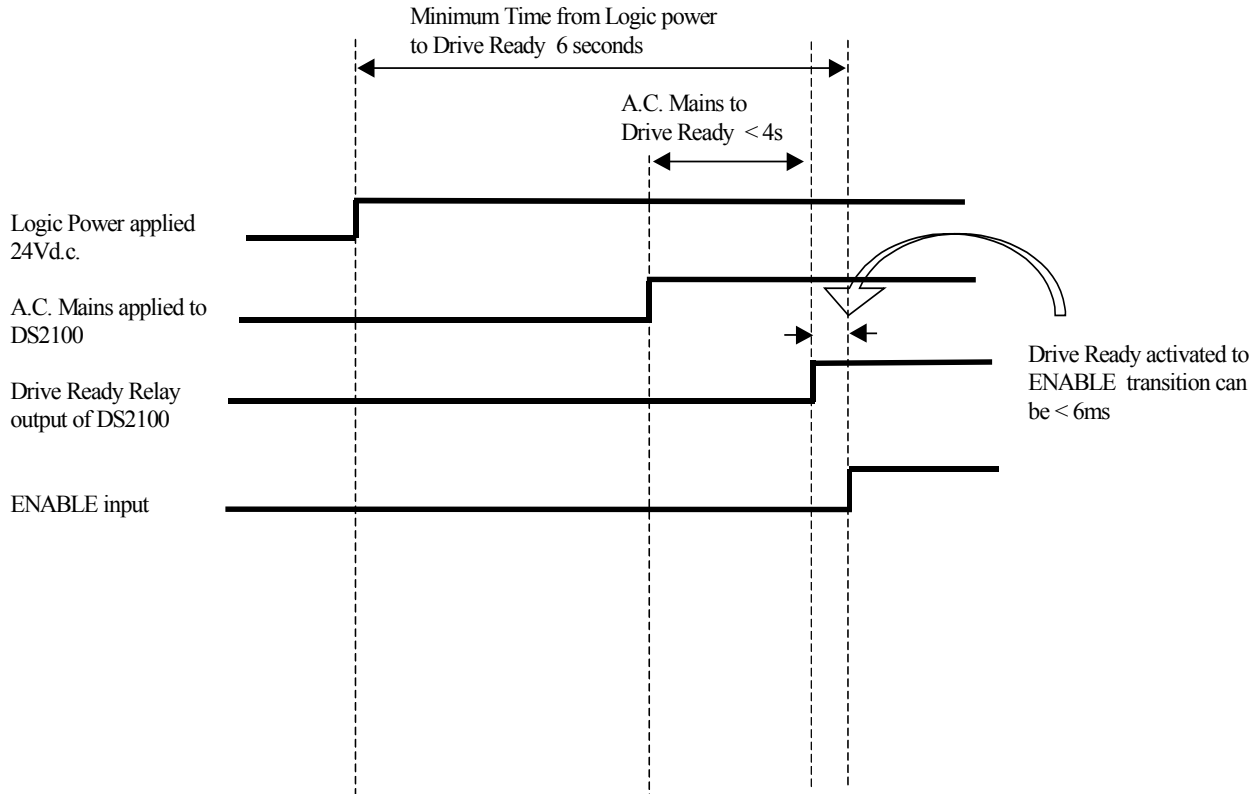


Figure 3.44 Power Sequencing control using Drive Ready Relay and ENABLE



WARNING - It is UNSAFE to use the Drive Ready output as a direct control for the ENABLE. The Drive Ready output will switch off when a fault occurs, and will switch on when the fault is cleared. This may result in an inadvertent enable of high power to the DS2100 high power amplifier, resulting in unexpected high voltage application or motion.

The System Motion Controller should examine the state of the Drive Ready relay output separately, and then enable the DS2100 high power amplifier if appropriate

3.13 Communications Interface Wiring and Configuration

The DS2100 provides one serial interface (RS232) for communication between the drive and the Windrive graphical user interface (GUI).

The drive also provides a CAN High speed (ISO11898-2) hardware-interface for higher bandwidth communications between one System Motion Controller and many DS2100's (which can handle motion commands between the System Motion Controller and DS2100's)

3.13.1 RS232 Serial Communications Interface

The pin assignment enables use of a 9-pin Sub-D cable with all signals connected straight through.

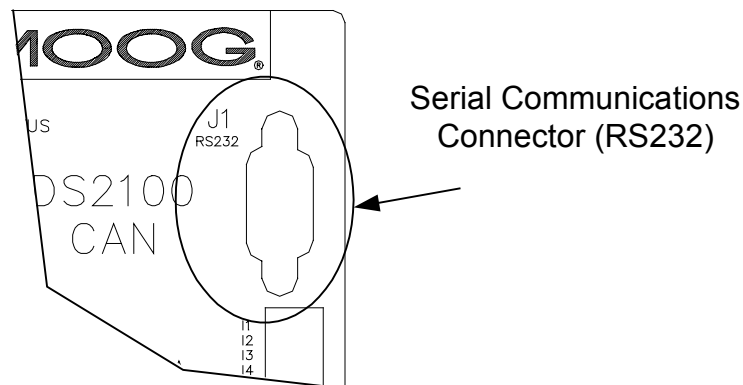


Figure 3.45 RS232 Connector Location

- Fixed connector: 9 pin, female Sub-D connector
- Mating connector, 9 pin male Sub-D
- Wiring: cable. 28-18AWG (0.14-0.82mm²)

Pos.	Name	Function	PC Signal
J1.1	-	connected to pin 4	DCD input
J1.2	TxD	Transmit Data	RxD input
J1.3	RxD	Receive Data	TxD output
J1.4	-	connected to pin 1 and 6	DTR output
J1.5	Gnd	Gnd	Gnd
J1.6	-	connected to pin 4	DSR input
J1.7	-	connected to pin 8	RTS output
J1.8	-	connected to pin 7	CTS input
J1.9	-	unused	RI input

Table 3.29 J1, DS2100 RS232 Serial Interface Connector

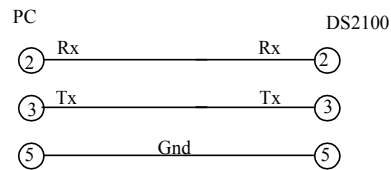


Figure 3.46 DS2100's J1 RS232 Wire Pin-out

The RS232 Cable shield should be connected to the metal body of the D-Type connector.

3.13.2 CAN Cable Wiring

The CAN-In and CAN-Out ports at J3A and J3B of the DS2100 provide the means to daisy-chain the CAN cabling between DS2100 units and system controller. The CAN interface is equipped with driver and receiver for 24V systems. These are optically isolated from the internal drive electronics for noise immunity. Internal supply of the isolated side of the CAN is provided. No user supplied voltage is required. Two daisy chained 9-way D-Sub connectors, one male, one female are also provided for ease of wiring.

Please refer to CAN Draft Standard 303, 'Cabling and Connector Pin Assignment' for further details of the CAN cabling requirements.

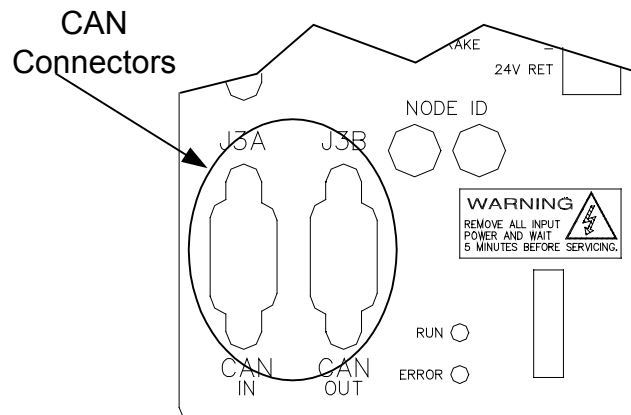


Figure 3.47 CAN Connector Location

- Fixed connector: 9 pin, male & female Sub-D connector
- Mating connector, 9 pin male & female Sub-D
- Wiring: cable. 28-18AWG (0.14-0.82mm²)

Pos (x=A,B)	Signal	Description
J3x.1	-	not connected
J3x.2	CAN_L	CAN_L bus line (dominant low)
J3x.3	CAN_GND	CAN Ground
J3x.4	-	not connected
J3x.5	CAN_SHLD	Chassis Ground
J3x.6	CAN_GND	CAN Ground
J3x.7	CAN_H	CAN_H bus line (dominant high)
J3x.8	-	not connected
J3x.9	-	Optional CAN external positive supply, not connected.

Table 3.30 CAN Connector Pin Description

Note:-

- CAN lines must be terminated in a 120Ohm resistance, between the positive and negative terminals (CAN-High and CAN-Low) at both ends of the CAN network for correct operation.
- All pins of J3A and J3B are wired straight through the connectors of the DS2100.

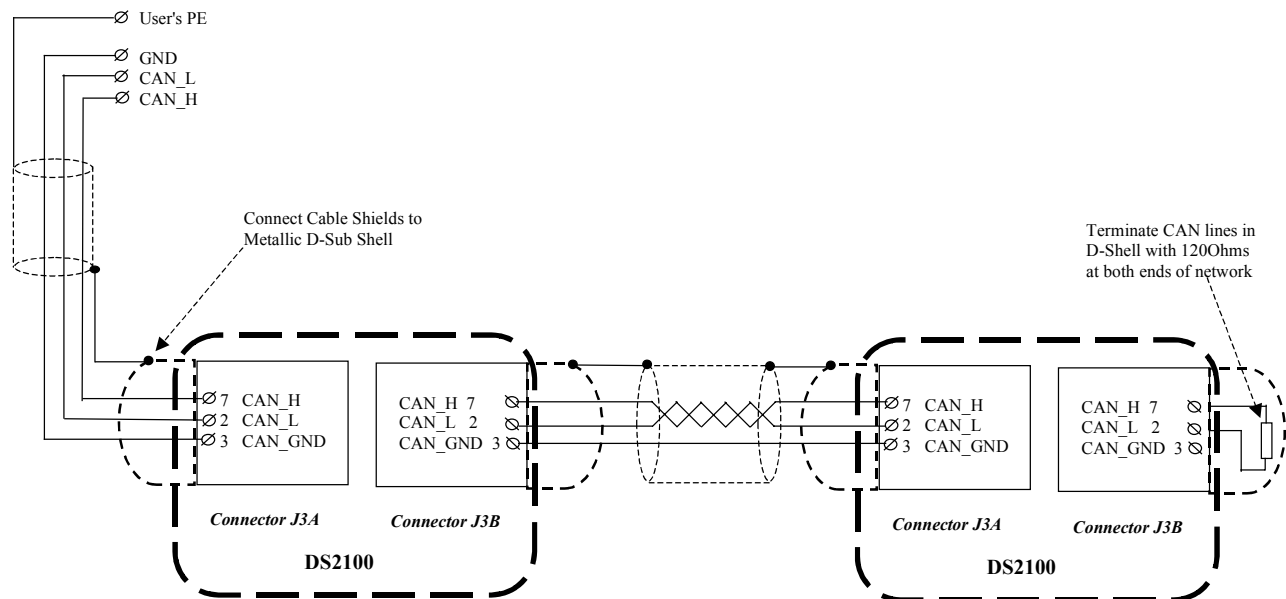
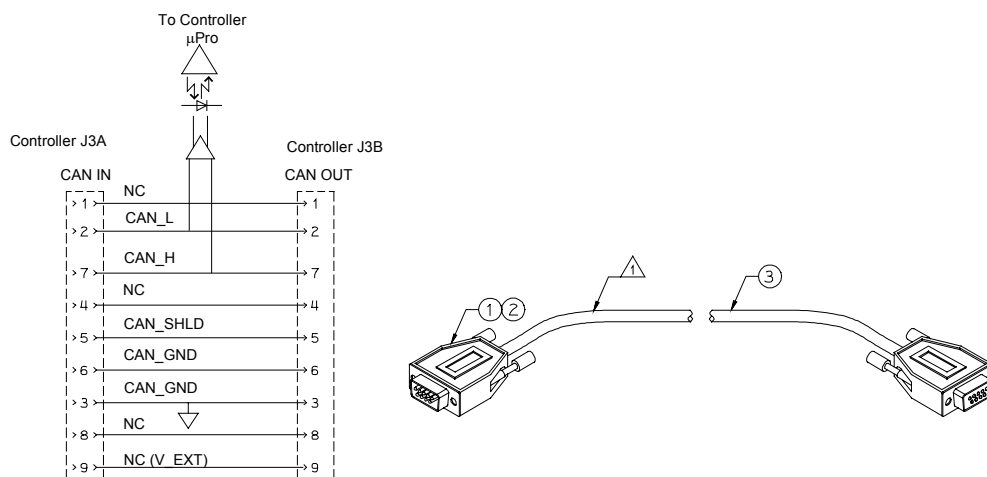


Figure 3.48 DS2100 CAN Wiring and Termination



Notes

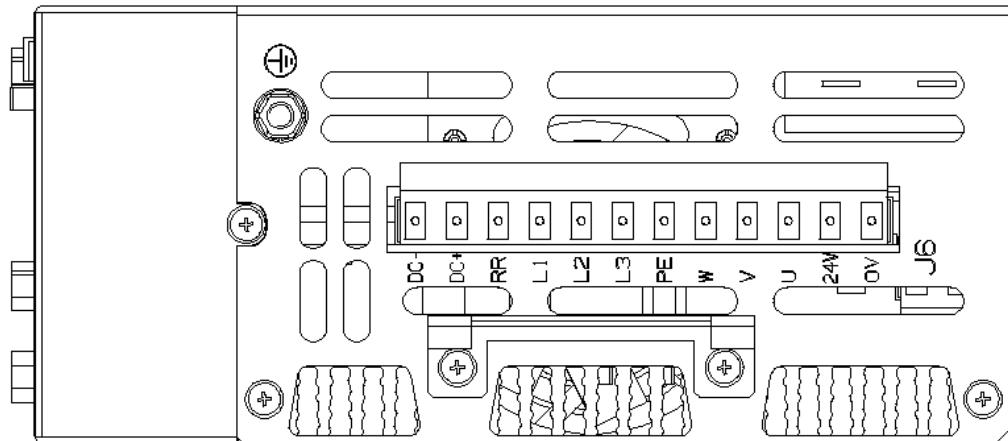
- △ CABLE LENGTH NOT TO EXCEED 40 METERS FOR 1MBAUD OPERATION.
CABLE SHOULD NOT EXCEED 100 METERS FOR 500KBAUD OPERATION.

FIND NO.	MOOG PART NO.	DESCRIPTION	QUANTITY
1	MAKE ITEM	CONNECTOR 9 WAY D TYPE MALE	USER SPLY
2	MAKE ITEM	CONNECTOR 9 WAY D TYPE FEMALE	USER SPLY
3	MAKE ITEM	CABLE BELDEN 9842	USER SPLY

Figure 3.49 CAN_L/CAN_H Connector (J3A and J3B) Wiring

3.14 Wiring Summary

3.14.1 μ A Size Power Stage



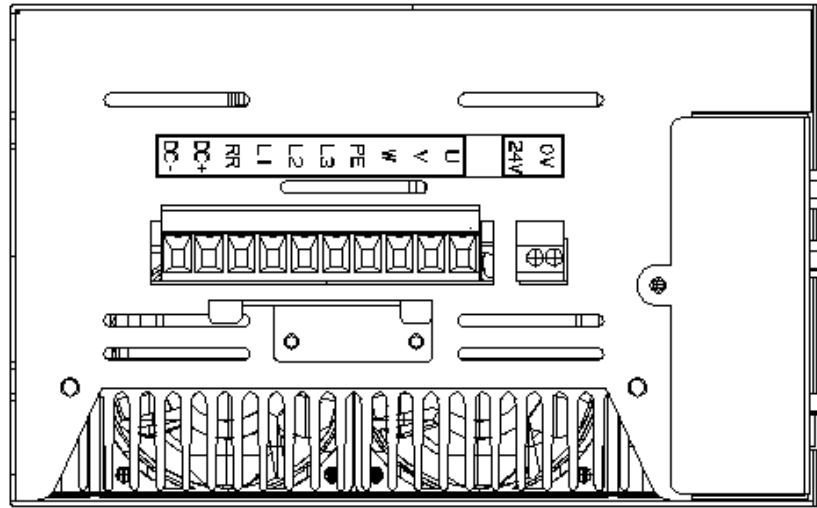
- Fixed connector: 12 pins, male connector
- Mating connector, 12 pins, female, supplied with the drive. Phoenix Combicon (Part # GMSTB 2.5/12-ST-7.62)
- μ A size wiring: cable 14 AWG (2.1 mm²). Wire stripping: 7 mm.
- Tightening torque: 0.5Nm.

Pos.	Name	Function
J6.1	DC-	DC Bus (-)
J6.2	DC+	DC Bus (+)
J6.3	RR	Regeneration Resistance
J6.4	L1	Phase "L1", three-phase voltage input 230/460Vac \pm 10%
J6.5	L2	Phase "L2", " , three-phase voltage input 230/460Vac \pm 10%
J6.6	L3	Phase "L3", " , three-phase voltage input 230/460Vac \pm 10%
J6.7	PE	Motor Protective Earth
J6.8	W	Motor Phase W
J6.9	V	Motor Phase V
J6.10	U	Motor Phase U
J6.11	24V	+24V Logic Backup Supply
J6.12	0V	Logic Supply Return

- PE Stud wiring: cable 6 AWG (13mm²)

Pos.	Name	Function
PE	PE	Protective Earth Stud on Chassis

3.14.2 A & B Size Power Stage



- Fixed connector: 10 pins, male connector
- Mating connector, 10 pins, female, supplied with the drive. Phoenix Contact (Part # PC4 HV/10-ST-7.62)
- A size wiring: cable 14AWG (2.1 mm²). Wire stripping: 7 mm
- B size wiring: cable 12AWG (3.3 mm²). Wire stripping: 7 mm
- Tightening torque: 0.5Nm.

Pos.	Name	Function
J6.1	DC-	DC Bus (-)
J6.2	DC+	DC Bus (+)
J6.3	RR	Regeneration Resistance
J6.4	L1	Phase "L1", three-phase voltage input 230/460Vac ±10%
J6.5	L2	Phase "L2", ", three-phase voltage input 230/460Vac ±10%
J6.6	L3	Phase "L3", ", three-phase voltage input 230/460Vac ±10%
J6.7	PE	Motor Protective Earth
J6.8	W	Motor Phase W
J6.9	V	Motor Phase V
J6.10	U	Motor Phase U

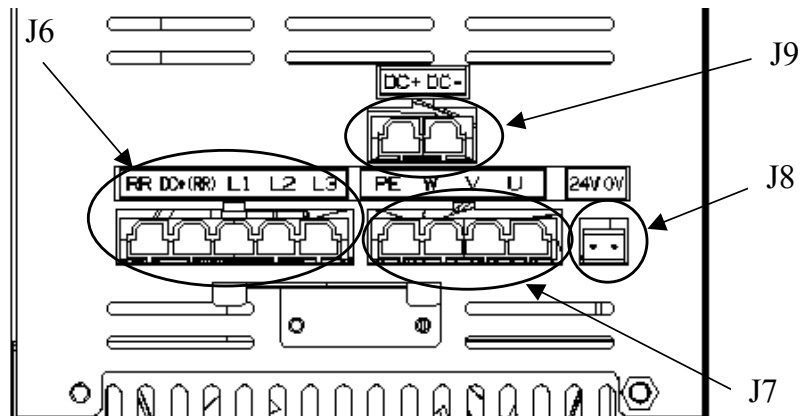
- Fixed connector: 2 pins, male connector
- Mating connector, 2 pins, female, supplied with the drive. Wago (Part # 231-102/026-000)
- C & D size wiring: cable 14 AWG (2.1 mm²).
- Stripping Length 8mm

Pos.	Name	Function
J8.1	24V	+24V Logic Backup Supply
J8.2	0V	Logic Supply Return

- PE Stud wiring: cable 6 AWG (13mm²)

Pos.	Name	Function
PE	PE	Protective Earth Stud on Chassis

3.14.3 C Size Power Stage



- Fixed connector: 5 pins, male connector
- Mating connector, 5 pins, female, crimped supplied with the drive. (Molex 42816-0512)
- C size wiring: cable 8 AWG (8.4 mm²).

Pos.	Name	Function
J6.1	L3	Phase "L3", " , three-phase voltage input 230/460Vac $\pm 10\%$
J6.2	L2	Phase "L2", " , three-phase voltage input 230/460Vac $\pm 10\%$
J6.3	L1	Phase "L1", three-phase voltage input 230/460Vac $\pm 10\%$
J6.4	DC+(RR)	DC Bus (+) (Regeneration Resistor connection)
J6.5	RR	Regeneration Resistor

- Fixed connector: 4 pins, male connector
- Mating connector, 4 pins, female, crimped supplied with the drive. (Molex 42816-0412)
- C size wiring: cable 8 AWG (8.4 mm²).

Pos.	Name	Function
J7.1	U	Motor Phase U
J7.2	V	Motor Phase V
J7.3	W	Motor Phase W
J7.4	PE	Motor Protective Earth

- Fixed connector: 2 pins, male connector
- Mating connector, 2 pins, female, supplied with the drive. Wago (Part # 231-102/026-000)
- C & D size wiring: cable 14 AWG (2.1 mm²).
- Stripping Length 8mm

Pos.	Name	Function
J8.1	24V	+24V Logic Backup Supply
J8.2	0V	Logic Supply Return

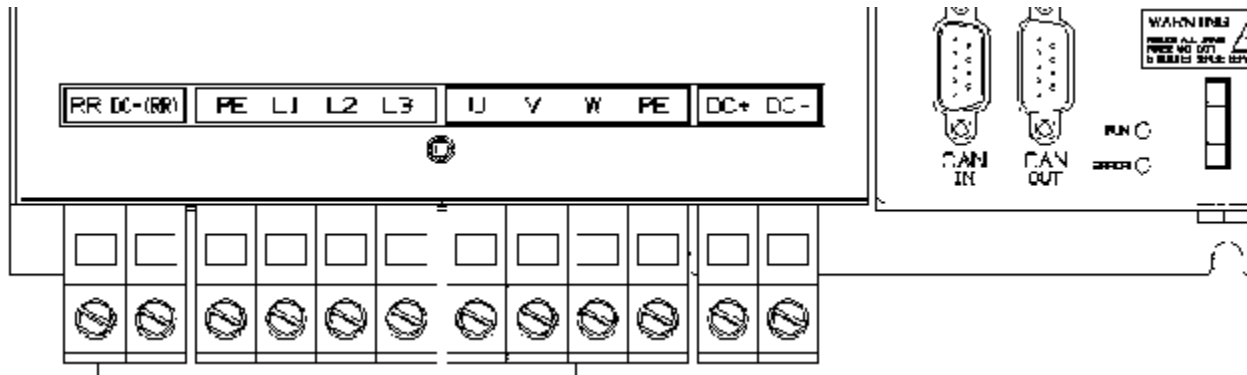
- Fixed connector: 2 pins, male connector
- Mating connector, 2 pins, female, crimped supplied with the drive. (Molex 42816-0212)
- C size wiring: cable 8 AWG (8.4 mm²).

Pos.	Name	Function
J9.2	DC+	DC Bus (+)
J9.1	DC-	DC Bus (-)

- PE Stud wiring: cable 6 AWG (13mm²)

Pos.	Name	Function
PE	PE	Protective Earth Stud on Chassis

3.14.4 D Size Power Stage



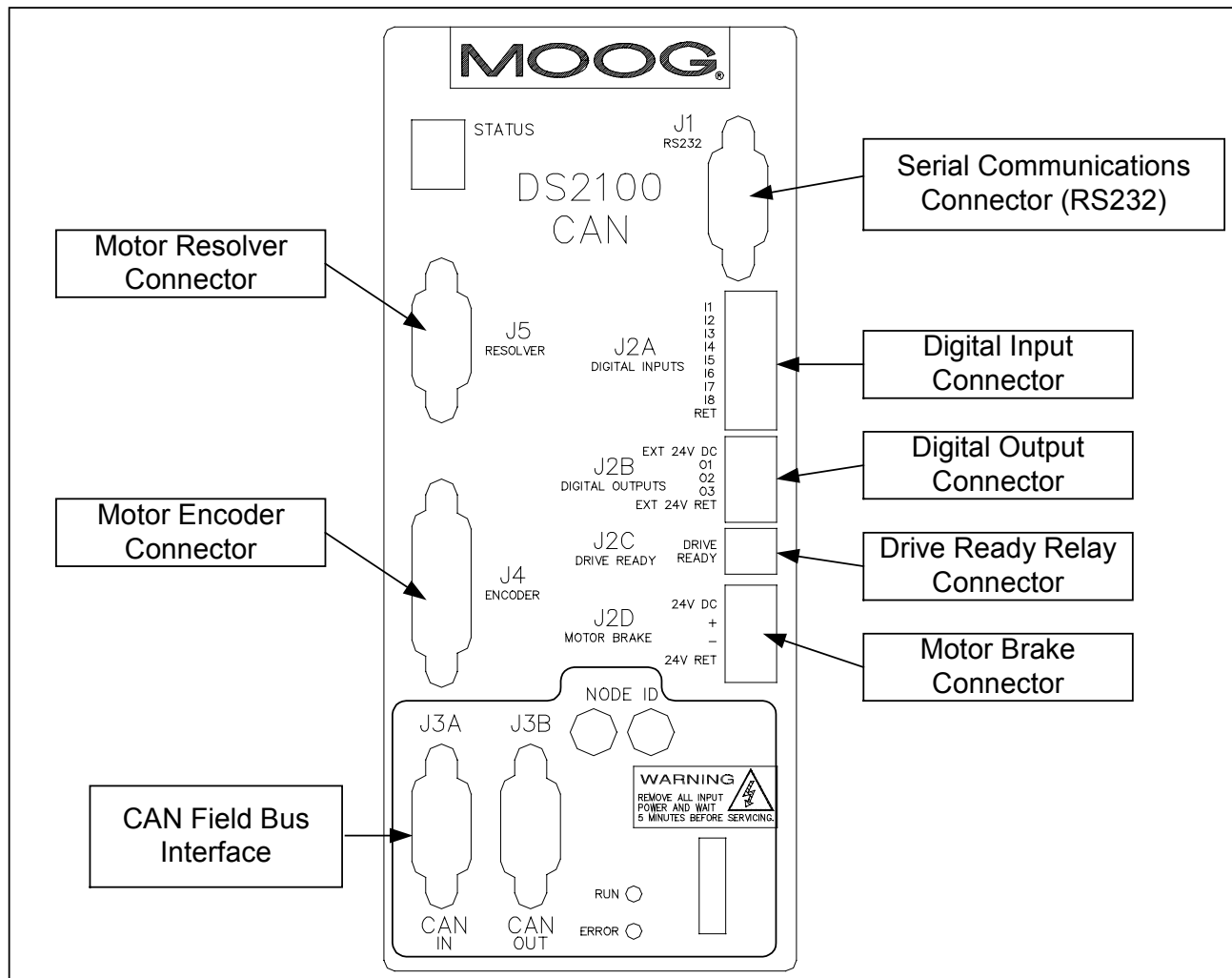
- Fixed connector: 4 pole, screw terminal
- D size wiring: cable 6 AWG (13 mm²) for 50/140
- D size wiring: cable 4 AWG (21 mm²) for 60/180
- PE Terminal wiring: cable 6 AWG (13 mm²) for 50/140
- PE Terminal wiring: cable 4 AWG (21 mm²) for 60/180
- Stripping Length 16mm
- Tightening Torque: 2-2.3Nm

Pos.	Name	Function
J9.1	RR	Regeneration Resistance
J9.2	DC+(RR)	DC Bus (+)
J9.3	PE	Protective Earth Screw Terminal
J9.4	L1	Phase "L1", three-phase voltage input 230/460Vac $\pm 10\%$
J9.5	L2	Phase "L2", ", three-phase voltage input 230/460Vac $\pm 10\%$
J9.6	L3	Phase "L3", ", three-phase voltage input 230/460Vac $\pm 10\%$
J9.7	U	Motor Phase U
J9.8	V	Motor Phase V
J9.9	W	Motor Phase W
J9.10	PE	Motor Protective Earth
J9.11	DC+	DC Bus (+)
J9.12	DC-	DC Bus (-)

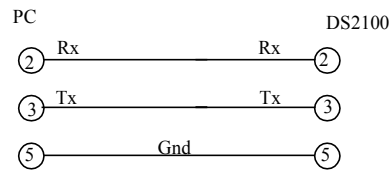
- Fixed connector: 2 pins, male connector
- Mating connector, 2 pins, female, supplied with the drive. Wago (Part # 231-102/026-000)
- D size wiring: cable 14 AWG (2.1 mm²).
- Stripping Length 8mm

Pos.	Name	Function
J8.1	24V	+24V Logic Backup Supply
J8.2	0V	Logic Supply Return

3.14.5 Control Card



3.14.5.1 RS232



- Fixed connector: 9 pin, female Sub-D connector
- Mating connector, 9 pin male Sub-D
- Wiring: cable. 28-18AWG (0.14-0.82mm²)

Pos.	Name	Function	PC Signal
J1.1	-	connected to pin 4	DCD input
J1.2	TxD	Transmit Data	RxD input
J1.3	RxD	Receive Data	TxD output
J1.4	-	connected to pin 1 and 6	DTR output
J1.5	Gnd	Gnd	Gnd
J1.6	-	connected to pin 4	DSR input
J1.7	-	connected to pin 8	RTS output
J1.8	-	connected to pin 7	CTS input
J1.9	-	unused	RI input

3.14.5.2 Digital Inputs

- Fixed connector: 9 pins, male connector
- Mating connector, 9 pins spring cage, female, supplied with the drive. Phoenix Contact (Part # FK-MC 0.5/9-ST-2.5)
- Wiring: cable. 28-20AWG (0.14-0.5mm²)
- Wire stripping: 8 mm

Pos.	Name	Function	
J2A.1	I1	Digital Input # 1	Drive Enable
J2A.2	I2	Digital Input # 2	User Configurable
J2A.3	I3	Digital Input # 3	User Configurable
J2A.4	I4	Digital Input # 4	User Configurable
J2A.5	I5	Digital Input # 5	User Configurable
J2A.6	I6	Digital Input # 6	User Configurable
J2A.7	I7	Digital Input # 7	User Configurable
J2A.8	I8	Digital Input # 8	User Configurable
J2A.9	RET	Digital Input Ground	

3.14.5.3 Digital Outputs

- Fixed connector: 5 pins, male connector
- Mating connector, 5 pins spring cage, female, supplied with the drive. Phoenix Contact (Part # FK-MC 0.5/5-ST-2.5)
- Wiring: cable. 28-20AWG (0.14-0.5mm²)
- Wire stripping: 8 mm

Pos.	Name	Function	
J2B.1	Ext 24V DC	+24V Digital Output Supply	
J2B.2	O1	Digital Output #1	User Configurable
J2B.3	O2	Digital Output #2	User Configurable
J2B.4	O3	Digital Output #3	User Configurable
J2B.5	Ext 24V Ret	Digital Output Return	

3.14.5.4 Drive Ready

- Fixed connector: 2 pins, male connector
- Mating connector, 2 pins spring cage, female, supplied with the drive. Phoenix Contact (Part # FK-MC 0.5/2-ST-2.5)
- Wiring: cable. 28-20AWG (0.14-0.5mm²)
- Wire stripping: 8 mm

Pos.	Name	Function	
J2C.1	Drive Ready 1	Drive ready relay contact pin 1	Drive Ready Relay Contact
J2C.2	Drive Ready 2	Drive ready relay contact pin 1	Drive Ready Relay Contact

3.14.5.5 Motor Brake

- Fixed connector: 4 pins, male connector
- Mating connector, 4 pins spring cage, female, supplied with the drive. Phoenix Contact (Part # FK-MCP 1.5/4-ST-3.81)
- Wiring: cable. 28-16AWG (0.14-1.5mm²)
- Wire stripping: 9 mm

Pos.	Name	Function
J2D.1	24V DC	Brake 24V Supply
J2D.2	+	Brake +
J2D.3	-	Brake -
J2D.4	24V RET	Brake 24V Supply Return

3.14.5.6 CAN

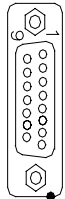
- Fixed connector: 9 pin male & female, Sub-D connector
- Mating connector, 9 pin male & female Sub-D
- Wiring: cable. 28-18AWG (0.14-0.82mm²)

Pos (x=A,B)	Signal	Description
J3x.1	-	not connected
J3x.2	CAN_L	CAN_L bus line (dominant low)
J3x.3	CAN_GND	CAN Ground
J3x.4	-	not connected
J3x.5	CAN_SHLD	Chassis Ground
J3x.6	CAN_GND	CAN Ground
J3x.7	CAN_H	CAN_H bus line (dominant high)
J3x.8	-	not connected
J3x.9	-	Optional CAN external positive supply, not connected.

3.14.5.7 Encoder

- Fixed connector: 15 pin, female Sub-D connector
- Mating connector, 15pin male Sub-D
- Wiring: cable. 28-18AWG (0.14-0.82mm²)

15-Pin Sub-D Connector
Plug (male) on cable



DS2100 Cable End
J4

Pos	Encoder Type			
	Analogue	SSI	Hiperface	Endat
J4.1	Shield	Shield	Shield	Shield
J4.2	- Sine	-	- Sine	- Channel A
J4.3	- Cosine	-	- Cosine	- Channel B
J4.4	Gnd Supply	Gnd Supply	Gnd Supply	Gnd Supply
J4.5	- Channel Z (Zero)	- Data	RS485 -	- Data
J4.6	-	- Clock	-	- Clock
J4.7	-	-	-	-
J4.8	NTC/PTC	NTC/PTC	NTC/PTC	NTC/PTC
J4.9	+ Sine	-	+ Sine	+ Channel A
J4.10	+ Cosine	-	+ Cosine	+ Channel B
J4.11	+5 V .. +12V Supply (150 mA max.)	+5 V .. +12V Supply (150 mA max.)	+5 V .. +12V Supply (150 mA max.)	+5 V .. +12V Supply (150 mA max.)
J4.12	+ Channel Z (Zero)	+ Data	RS485 +	+ Data
J4.13	- Fault	+ Clock	-	+ Clock
J4.14	Gnd Supply	Gnd Supply	Gnd Supply	Gnd Supply
J4.15	NTC/PTC	NTC/PTC	NTC/PTC	NTC/PTC

3.14.5.8 Resolver

- Fixed connector: 9 pin, female Sub-D connector
- Mating connector, 9 pin male Sub-D
- Wiring: cable. 28-18AWG (0.14-0.82mm²)

MOTOR RESOLVER CONNECTOR				
Pos	Signal Type	FAS T/ FAS K	FAS N/ FAS Y	G4xx (FASG)
J5.1	$\cos\phi$ (S2)	C	1	3
J5.2	$\overline{\cos\phi}$ (S4)	E	2	4
J5.9	V-Ref (R1)	D	10	7
J5.7	0V (R2)	B	7	8
J5.8	PTC/NTC	N	8	6
J5.6	PTC/NTC	A	9	5
J5.4	$\sin\phi$ (S1)	G	11	1
J5.5	$\overline{\sin\phi}$ (S3)	H	12	2
J5.3	Shield	S	3	-

